METHODS OF TEACHING VOCATIONAL AGRICULTURE

SAMUEL H. DADISMAN

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SENATOR HOKE SMITH

METHODS OF TEACHING VOCATIONAL AGRICULTURE IN SECONDARY SCHOOLS

BY

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BOSTON

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FOREWORD

The Federal Law providing national aid for the promotion of vocational education is justifying the expectations of its friends, especially as it applies to agricultural education. Prior to the Smith-Hughes enactment, agriculture was slowly but surely finding its way into the curricula of the secondary schools of this country, notwithstanding the handicap of being treated most often like the other subjects, i.e., taught for informational purposes and its cultural value, rather than for vocational efficiency and only now and then being correlated with the activities of the community. High school agriculture has also suffered from the ministrations of inefficient or poorly prepared teachers. Because of the newness of the subject, the teaching standards were not so high as were those for teachers of other high school subjects. Not infrequently one could find an agricultural teacher giving instruction in three, four, and even five other lines of work and instances are known where the teachers in a high school were called together just before the term opened and required to draw lots to determine who would teach agriculture during the year.

The financial aid made available by the Federal Act has brought about not only a rapid increase in the number of agricultural departments in the high schools throughout the country, but it has for the first time in a majority of the states resulted in definite minimum standards being set for the work and higher qualifications being demanded in the preparation of the teacher.

The definite vocational standards established by the Smith-

Hughes Act are bringing about a very desirable degree of uniformity in the contents of the courses of study as well as in the methods of teaching agriculture throughout the country and the project and problems methods, first definitely worked out in the vocational agricultural courses in Massachusetts, are now being adopted in every state and are being applied to many subjects other than agriculture.

Another result of national aid is to be seen in the number and the rapid development of the agricultural teacher training departments in the various states and in the increasing number of hours or units of work being required in Education and Agricultural Education of those preparing to teach agriculture in the secondary schools. It is now realized, perhaps better than ever before, that the success or failure of agriculture in the high school depends largely upon the teaching ability and personality of the teacher. Greater responsibility is therefore placed on the teacher training departments. They should eliminate any student whose lack of personality or any other defect is likely to prove a handicap to a successful teaching career and they must endeavor to attract to their departments those outstanding students whose high scholarship and leadership ability give evidence of future teaching success.

The time will never come, we hope, when teacher trainers in the various states will have to follow uniform and cut-and-dried methods in preparing college students for the teaching profession. There will always be those exceptional teachers whose personality is the inspiration of their students and who need not depend upon more or less stereotyped subject matter and methods in training teachers. Most of us, however, feel the need of outlines and textbooks that will aid us in the daily routine of teacher training. The few texts that have appeared, thus far, excellent as they may be, deal with the methods and subject matter employed

before the advent of the Smith-Hughes Law. There is a new conception of the function of agriculture in the secondary school abroad in the land and our aim is vocational efficiency instead of the simple imparting of information.

This textbook by Professor Dadisman should be a welcome addition to the work-table of every teacher trainer, prospective teacher, and teacher in service for it has been evolved out of the very successful experiences of the author in preparing young men to teach agriculture according to the provisions of the state and national vocational education acts.

Professor Dadisman was probably the first teacher trainer in this country to utilize the project method in the training of agricultural teachers and his three years' experience in this particular field at the University Farm, Davis, California, has won for him well deserved recognition and praise.

F. L. Griffin,
Head of Division of
Agricultural Education.

Berkeley, California.
August 1, 1921.

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PREFACE

This book is the outgrowth of four years' experience in supervising classes for teachers of vocational agriculture. It is intended to be used as a text in training teachers and as a reference for those interested in better methods of teaching vocational subjects. It has been written to aid in developing better methods of presenting vocational agriculture. This book is not based upon theory alone, but upon processes through which the applications of these principles find their expression in class room and laboratory. Enough history of agricultural education is presented to give the teacher a fundamental understanding of the struggle that agriculture has undergone in finding its place in the curriculum of our public schools. The Smith-Hughes Act and state plans are presented as a background for the method of presentation. Other state plans are based upon the same general principles; namely, the project method and making the work less than college grade and suitable for those who expect to enter the farming profession.

The time has come when young men and women should learn in school how to maintain and improve the fertility of the soil, how to increase the yield of our economic plants, and how to raise domesticated animals on a more economical basis. They should also learn to meet market problems which are going to be a great factor with the future agriculturalists. The needs of country life will be satisfied only through coöperation and organization in developing a permanent agriculture. The future teacher of vocational agriculture must be trained to keep abreast of the improvements

in farm machinery and farm power. The social needs of farm life and the farm home should also be provided for through the schools. To aid in preparing teachers to satisfy these needs is the purpose of this book.

It has been said that the boys of to-day will be the men of to-morrow. It may as well be said that the school boys doing their project work will be the scientific farmers of the future. It is not the function of the school to attempt to show the specialist how to improve upon his work, but it is the function of the school to teach the average farm boy the scientific principles underlying the field of agriculture; to teach him the fundamentals of the supplemental subjects that he will need in his every day activities; to teach him to do the practical work; to teach him to keep business records of his enterprises; and to give him the training and desire to be a leader in the community.

The project method above all other methods so far tried out in teaching vocational agriculture, when properly presented, develops greater interest and more initiative. It gives the pupil "stick-to-it-ive-ness" to carry his undertakings to completion. It provides a basis for reasoning and offers adequate opportunity for direct thinking to a logical conclusion.

When the student teacher has been trained through proper methods of presentation to feel the real need of a thorough training in science and agriculture and to fully understand and appreciate the value of carefully planning and properly presenting his lessons, he will be better prepared to visualize his subject and make his work more worth while to the community.

S. H. D.

August 1, 1921.

METHODS OF TEACHING VOCATIONAL AGRICULTURE

AN EFFECTIVE TRADE MARK

METHODS OF TEACHING VOCATIONAL AGRICULTURE

CHAPTER I

THE DEVELOPMENT OF AGRICULTURAL EDUCATION

Agricultural education is not a new thought. It had its beginning in the dim ages of the unwritten past. Agriculture was first carried on by slaves who were given instruction by their masters. The first definite reference given to this subject was in 1015 B.C., when King Solomon had his extensive gardens. These gardens were undoubtedly used for instructional purposes, as well as for adornment. The first school gardens in Persia were for the purpose of training the sons of the noblemen to instruct the slaves. These gardens were laid out by King Cyrus, 589-529 B.C., and the schools in connection with them were probably among the first to give a definite course in agriculture.

The Chinese Civil Service Examination included agriculture as early as 150 B.C. The superstition in early agriculture is shown by the fact that the Chinese buried hogs with the dead in order that they might have meat to eat on their road traveling to the next world. We find Aristotle writing about the value of agriculture from 82-22 B.C. He felt the need of impressing agricultural training upon the common people. Plato in his writing discussed the soil in its relation to agriculture. He also felt that the common

A brief study of agricultural education is made in order to develop a background for its methods of presentation.

people should know more about the soil in order to raise better crops.

From the beginning of the Christian era until the nineteenth century, the schools devoted but little time to teaching agriculture. During this period instruction was largely based upon religion and superstition. There is a legend that King Alfred planted school gardens so that boys could have agricultural training. This is mentioned as the beginning of Oxford University. Thus agricultural education had its beginning in forestry and gardening.

In many of the European universities, gardens were probably used for instructional purposes. The first Italian school garden was laid out by a wealthy nobleman in the year 1525. This movement was soon followed by Italians in Venice and Naples. That Italians are good gardeners can be traced back to the fact that much emphasis was placed on the school garden in the early part of the sixteenth century. About the end of the sixteenth century, there was established in Paris a botanical garden which was designed to meet the floral needs of the court. This garden was undoubtedly used for instructional purposes as well as for adornment. The training in the flower gardens has had its artistic effect upon the development of the French people.

The Jesuits in 1534 argued that learning should have some relation to living things and that material for education should not be drawn from books alone, but from the external world—from the heavens, from the trees, and even from the usual occupations of men. The Jesuits seem to have had the idea that those who tilled the soil should receive some instruction that would aid them in their future agricultural pursuits. Comenius advocated the study of agriculture in 1560. He wanted a garden for every school where the children at times could gaze on the trees and herbs and be taught to enjoy them. No definite references

are given to where Comenius advocated the school children actually doing the work. He did, however, want them to study nature and about all living things.

Milton in his wide curriculum advocated the study of agriculture because it contained easy reading matter and enabled the students thereafter to improve tillage and to recover bad soil and wasted land. Hungary was teaching agriculture as early as 1630.

One of the first publications in agriculture in London was, *An Essay for the Advancement of Husbandry Learning*, written by Samuel Hartlib in 1651. His idea was to take the pupils as apprentices. He proposed to have four professors; one to be sent to Asia, one to Europe, one to Africa, and one to America to make a study of conditions and use the material that should prove helpful to them. The great University of Halle began teaching agriculture to farm folk in 1695. Its first teacher, Franke, said that he was much interested in the poor and farm folk. His first courses of study of agriculture were published about the end of the sixteenth century. The Hungary University of Science at Buda established a chair of agriculture and experimental grounds in 1777. Rousseau pointed out the importance of garden work as an educational factor. He would actually have the children do the garden work in connection with the school. Much emphasis has been placed upon Rousseau's methods of instruction in agriculture. It was about this time that Salzman rightly said, "School gardens have been laid out neither to draw the attention of passers-by nor to give great returns, but to instruct." A Swiss educator, Fellenberg, took great interest in the peasantry of his country and established a school, the object of which was to train definitely for a trade or occupation. Agriculture was the basis for his instruction and it is probable that Fellenberg used the apprentice method. Jethro Tull's *Horse-Hoeing*

Husbandry, written 1751, was the basis for instruction in many schools.

As early as 1761 the National Society of Agriculture in France advocated the appointment of agricultural professors to arouse and enlighten public opinion with reference to agricultural affairs. This resulted in the establishment of a school of agriculture as early as 1763. However, agriculture was not placed on the program of the French schools until 1882, when instruction in agriculture was organized in primary, normal, and superior schools of the country.

The work of Thaer marks a new epoch in the history of German agriculture. He applied science and sound business methods so successfully on his own farm that farmers from all over the continent came to visit it. His instruction was given so well to his visitors that they soon began to teach his principles of agriculture in other places. Even Pestalozzi opened a school in Switzerland for instruction combined with labor in the fields. His students devoted their mornings to study and their afternoons to farming. He said that he wished to make his estate the central point of agricultural and educational efforts. Froebel, the founder of the kindergarten, recommended light gardening as one of its occupations and advocated the children actually doing part of the work. The Royal College of Denmark was not opened until 1773, but still her work in agricultural education excelled that of the United States until recently.

The first farm school established in Canada in 1868 was the beginning of agricultural education in that country. At this date Lesser Seminary was established and it was here that the children of artisans and peasants were taught farming and the various mechanical arts. As was also the custom in England, the pupils were grounded in the customs of the church. As early as 1836 we find a bill passed in the upper legislative assembly, which authorized the trustees of any

school district to collect money for leasing or purchasing land, farm utensils, seeds, grains, and grasses for the use of the school teachers. It laid emphasis on growing vegetables, fruits, grains, and grasses. A normal school was established at Toronto in 1847 in which agriculture was given a permanent place. Daily classes were conducted in agricultural chemistry, demonstration plots were laid out, and practical field demonstrations were conducted. The Governor General in 1849 offered two prizes of the value of twenty-five dollars to each of the two persons who passed the best examination in agricultural chemistry. The first agricultural reader for the use of schools in Canada was published by John Stimson of Niagara Falls in 1846. Ryerson published his *First Lessons in Agriculture* in 1870. Mill's *Public School Agriculture* soon followed. The latter was the first authorized textbook used in the public schools of Ontario, as well as the first to receive recognition as an agricultural text in America. In 1874 the first agricultural college in Canada was established in the province of Ontario and the first summer school for teachers of agriculture was held there in 1893. Agriculture was made compulsory in their rural schools as early as 1899.

The first authentic account of agricultural instruction in the United States was in 1671 when William Smith designed a model school for colleges. His plan was to teach the chemistry of agriculture, which was partly put into practice in the University of Pennsylvania. We find that in 1671 Governor Berkeley of Virginia said, "I thank God there are no free schools nor printing, and I hope we shall not have these for three hundred years, for learning has brought disobedience, and heresy, and sects into the world, and printing has divulged them and libels against the best government; God keep us from both."[1]

[1] Dexter—*History of Education in the United States*, p. 10.

Benjamin Franklin was one of the early advocators of agricultural education. In his proposal relating to education of the youth of Pennsylvania, he said, "The youth should learn those things that are most useful in the several professions for which they are intended." He advocated gardens, meadows, and fields in connection with the schools, so that there might be accompanied with them practical exercises in agriculture and excursions to the neighboring plantations and to the best farms to observe their methods for the purpose of giving an opportunity to improve agriculture. "This subject is useful to all and not detrimental to any." We find that the Philadelphia Society for the Promotion of Agriculture in 1794 outlined a plan of community agriculture for the citizens of the State. Part of the plan was to create county societies with the country school masters as secretaries and the school houses as their meeting places. The societies also proposed to introduce agricultural books into the schools.

In Kings College, now Columbia University, husbandry and commerce were included in the curriculum in 1754. Agriculture was adopted by the Governor in the Laws and Orders the following year.

One of the first purely agricultural schools in the United States was founded in 1797 at Letham, South Carolina, by John D. Lahows. He left an endowment of a farm of six hundred acres of land, one hundred of which was to be in forest. The purpose of this endowment was for the education, boarding, and clothing of twelve poor boys and twelve poor girls of the district.

The first purely agricultural, industrial, and technical college was founded in 1821 at Gardener, Maine. The State Legislature granted a thousand dollars, which was probably the first state grant made in the United States for this purpose. A boarding house was established at which the

students could secure board and washing for $1.25 per week and a room with a chair, table, and a cot for $0.25 per week.

One of the very best examples of early agricultural education in the United States was in New Harmony, Indiana, in 1824. It was here that William McClure had the Pestalozzi methods of teaching put into practice. In spite of the expensive equipment; dormitory, books, museum, shops, experimental plots, etc., religious strife and intolerance interfered with the experiment.

George Washington Gale established a manual labor institute in Oneida, New York, in 1827. His curriculum included practice, both in carpentry and agriculture. This retired minister took a number of boys from a farm and gave them practical instruction. He later founded Knox College at Galesburg, Illinois.

The first textbook in agriculture in the United States for use in the schools was the *Agriculture Reader* by Daniel Evans, published in 1824.

We find many sporadic attempts to get agriculture established in our schools during the last century. The farm school at Boston is one of the few that succeeded. Instruction was given in agriculture in this school in 1883, and has been taught there for thirty-seven years. From the many attempts during the last century to introduce this subject into the schools, no definite system of instruction has yet been established. From these early attempts to 1862 was the period of introducing agriculture into the academies. From all the schools mentioned, the Boston Farm School was the most important factor in the development of industrial education in that part of the United States.

The Michigan State Agricultural College was founded in 1857 and included six hundred and seventy-six acres of heavily timbered land. The Maryland Agricultural College

began instruction in 1859, and it was conducted for three years as a private institution. However, the college did accept the land grant fund in 1862, but did not become a wholly state institution until 1914. The Kansas Agricultural College likewise had its origin as a sectarian institution. The New York State College of Agriculture had a separate department of agriculture as early as 1860.

The early attempts at instruction opened the way to establish agricultural instruction in the schools of the United States, which began on a permanent basis by Federal aid in the form of the land grants.

CHAPTER II

DEVELOPING THE PRESENT DAY AGRICULTURE

In planning the courses of study it is worth noting how the present system of agriculture has been developed. Mention has already been made of the introduction of it in the high school. The introduction in the grammar schools began in the form of nature study. They had been observing the robin for its beauty instead of as a destroyer of insects. More than two dozen elementary agricultural textbooks appeared, each expressing the individuality of its author, which depended upon his preparation and vision of the type of work. This is the reason we have had no definite course of study until recently. Secondary agriculture, varying in content of course and method of presenting, has been introduced into the following types of schools:—township consolidated as in Illinois; county agricultural schools as in Tennessee; Congressional district agricultural schools as in Arkansas; judicial district schools as in Oklahoma; union district schools as in California; junior high schools as in Vermont; and special agricultural schools of a secondary nature in connection with the state university as in Minnesota.

Many of the first courses in secondary schools were of a general nature following Dr. Warren's *Elements of Agriculture.* Other books soon followed. Then came the state courses as that of Minnesota, Illinois, Iowa, and Texas with outlines for a four year course in agriculture. A survey made by the author in 1917 showed that the first year's work

in the various states was called by nineteen different names. This clearly demonstrated the need of uniformity in nomenclature and content. However, according to the United States Bureau of Education there were only nineteen schools teaching agriculture in 1901, while in 1916 there were 2,175 schools teaching agriculture. Only 586 were teaching it with a vocational aim. Of the 41,074 pupils enrolled in the classes, 16,331 were girls.

During the reconstruction period after the Civil War, there was a great unrest from the course of study then in operation. Many of the leading educators believed that there was a need for a course in the high school which should function in the bread and butter aim of life for a large number of the pupils. Out of this unrest grew a course aimed to select from the science courses things that the pupil should know. Many began with the chemical elements that were foreign to the pupils. Others began with so much physics, zoology, or botany depending upon the teacher's preparation. Many textbooks soon appeared covering such courses. The method of presentation was also similar to that of the teacher's college experience. This method of presentation by specialists of so much of their particular subject, regardless of its application to the present or future usefulness of the pupils, caused the course to become unpopular. Another class of teachers started out to use expensive apparatus for this course and thereby caused its elimination in many schools which could not afford expensive equipment.

This course needed unification in order to give the pupil something worth while for future usefulness. Since the population of the world is directly dependent upon the products of agriculture, it seemed to be the logical core around which the material should be centered.

The general conception of the reorganized course was that

to be worth while, it must fit into the child's needs at the time it is given. It must be something that will create an interest in the subject; something that applies to the child's daily work; something that he can contribute to as the work progresses. It must reach out into the field of biological, physiological, and other sciences which will illuminate the subject at hand with the proper methods of presentation.

This course has finally taken one of two directions. In some schools it has drifted into the purely science, or rather never been separated from it and is called general science, taught by the purely science teacher where agriculture is mentioned only incidentally. In other schools the course is called agricultural science and in many schools it is called general agriculture, where the sciences are used as the servants to illuminate the subject under consideration. In many of the up-to-date schools of the United States, this course is being taught in the eighth grade, paving the way for real agriculture in the high school. Gardens on the school ground were often found valuable in connection with this course.

The school farm has been one of the problems of the high school teacher. There has always been a variation in size of the school farm, from that of a small plot to ten acres. In 1917 the high school farms in California varied from a demonstration plot to twenty-seven acres, averaging two and three-fourths acres. The average size has been greatly reduced since that time. Many have no land on the school grounds for agricultural purposes. The school farms have been used as demonstrational, model and experimental farms. They are now being used in most places only for outdoor laboratory purposes. In some places where the pupil has not land at home or is boarding, the school farm is successfully used for project work. A few schools are still using it for plant propagation purposes. The

proper size for the school farm seems to be only as large as can be utilized for strictly educational purposes.

By having the pupils actually do the work, came the idea of vocational agriculture, which means gaining knowledge necessary for successful farming. It has for its purpose the training of the youth so that he may be better prepared for scientific farming in a rural community and to give him the skill necessary in plant and animal production. Massachusetts in 1908 was the first state to recognize the vocational aim. This idea was soon followed by New York, Pennsylvania, Maryland, etc.

The great desire of many of the parents has been for the school to train their sons and daughters for better positions in the trades and industries. The examples of good work being done in vocational agriculture, paved the way for the vocational act. Senator Hoke Smith of Georgia with others fostered the Smith-Hughes Bill and later the Smith-Sears Bill. The Smith-Lever Bill has done much to unify this work with a vocational trend.

When the agricultural courses in the schools are properly planned and are carefully carried out, they will be the most economical features in determining the future of the agricultural industries of the United States.

Before working out the contents of any course of study, one should have pretty clearly in mind the type of pupils he is going to teach, the material he is going to present and the best methods of presenting it. This is now being made possible since the Smith-Hughes Bill provides sufficient funds for the training of agricultural teachers.

THE OLD SCHOOL BUILDING

THE RURAL CONSOLIDATED SCHOOL BUILDING AT ROLLO, ILLINOIS
(The author was the first president)

MARKETING HIS PROJECT CABBAGE

Huntington Beach, California

I AM A SMITH-HUGHES PIG

I AM NOT

CHAPTER III

INFLUENCE OF AGRICULTURAL LEGISLATION

The greatest factor in fostering a definite system of agricultural education has been the government aid. The Patent Office was made a separate bureau in 1836 with H. L. Ellsworth, a practical farmer as its first commissioner. One of his duties was the distribution of seeds and plants, which was made through the members of Congress in franked envelopes. This method of distribution still continues. While a few yearly appropriations were made for this purpose, the first separate appropriation was made in 1854, when the sum of $35,000 was voted.

The Morrill Land Grant Act[1] of 1862 granted to each state 30,000 acres of public land for each senator and representor in Congress to which the states were entitled by the apportionment in the census of 1860. All money derived from these lands was to be invested in securities bearing not less than 5 per cent interest. The state legislature might authorize a sum of not more than 10 per cent of the capital for the purpose of purchasing sites for colleges and experimental farms. All interest was to be used for the maintenance of at least one college, where the leading object should be to teach such branches of learning as related to agriculture and the mechanic arts, in order to promote a liberal and broad education of industrial classes in the several pursuits and professions of life.

The states that had public land within their borders could

[1] *Bul.* 1918, No. 13, Dept. of Interior, Bureau of Education.

locate and take up the actual acres, but if the state had no lands within its borders subject to entry, land script was issued instead. The script had to be sold and the individual purchaser might locate land in any state that had public land subject to this entry.

Various states managed their lands in different ways. Some as Kentucky, Nevada, North Carolina, and Maine sold their land at 50 cents per acre. Others as Florida, Connecticut, Delaware, Iowa, and Massachusetts sold their land for from less than $1.00 to not more than $5.00 per acre. North Dakota and some other states sold their lands for not less than $10.00 per acre. The states making the best use of their lands were New York, California, and North Dakota; while Rhode Island made the poorest use. In many cases the lands were rented and sold later. The income from such lands was used for the support of the agricultural and mechanic arts colleges. Only Kentucky, South Carolina, and Virginia divided the income between institutions for negroes and white people. Missouri divided her funds between two colleges. Nineteen states have independent colleges of agriculture and mechanic arts, while at the same time they maintain colleges and state universities. In twenty-six states the college of agriculture is part of the university. Seven states do not have state universities.

The Hatch or Experimental Station Act of 1887 provided for an appropriation of $15,000 made to each state for the purpose of conducting experimental and research work. This was the first government station act. However, the first experiment station supported by state aid was in Connecticut in 1875.

The Second Morrill Act passed in 1890 provided $15,000 annually for each state with an additional increase of $1,000 per year until the fund should reach $25,000. This fund was to be used only for instruction in agriculture and

mechanic arts, the English language, and the various branches of mathematics, physics, natural economic sciences with a preparation for such instruction.

The Adams Act passed in 1906 made provision for additional aid to be used for research. The $5,000 annual appropriation for each state, was to be increased until the sum of $30,000 is reached.

The Smith-Lever Act passed 1914 was for the purpose of encouraging agricultural extension work. This bill provided for $10,000 annually to each state. The act makes provision for additional money, based upon the rural population. The states must duplicate the appropriation granted by the government. The act provides for coöperative agricultural extension work. Instruction is to be given under this act only to persons not attending college. Part of this fund is used in the various states for the agricultural clubs, which are for demonstrational purposes.

Not any of the money is to be used for the purchase, erection, or repair of buildings, or the purchase or rental of land, or in college courses promoting agricultural trains; and not more than 5 per cent of the annual appropriation shall be used for the printing or distribution of publications. Part of the Farm Advisor's expenses is to be paid from the Smith-Lever funds.

"The Smith-Sears Act[1] passed in June, 1918, provides for the rehabilitation and return to civil employment of disabled persons discharged from the military or naval forces of the United States."

It delegates to the Federal Board for Vocational Education the duty of re-educating the disabled persons in more useful employment which the Board shall deem them capable of following with profit. While the disabled persons are taking the special courses, compensation is being allowed

[1] The Smith-Sears Bill.

them and family allowance is being paid their families precisely as if they were still in active service. The total appropriation for this work is $2,000,000. When the course has been completed, agencies are ready to assist the re-educated persons to obtain positions in civil life.

The Smith-Hughes Bill signed February 23, 1917 marks another great epoch in the vocational education movement in the United States. It has two distinct functions, namely, to train for vocational agriculture, trades and industries, and home economics, and to aid in paying the teachers' salaries for these three subjects.

Beginning with the reconstruction period after the Civil War, a need was felt for better trained people in various industrial lines and the old saying, "As the tree is inclined so are its branches," or "As training, so will the person be," was gradually being put into practice. Our experience, profiting by that of Europe, shows that where industrial agriculture is finding its way, more efficient farming is being done. In Massachusetts for example, the same things were true with trades and industries. Some of the leading states, before the passage of the Smith-Hughes Bill, in vocational agriculture were Massachusetts, New York, Indiana, Oklahoma, and Maryland. The work that these states were doing demonstrated the value of vocational agriculture.

"The Smith-Hughes Bill[1] has for its purpose coöperating with the state and paying the salaries of teachers, supervisors, and directors of agricultural subjects, teachers of trades and industries, and teachers of home economics as well as the preparation of teachers for the same. This bill also carries with it the obligation that the state must pay one dollar for every dollar expended by this bill, as well as meet the minimum standard requirements. The education for this employment shall be of less than college grade and shall be

[1] The Smith-Hughes Bill.

designed to meet the needs of persons over fourteen years of age, for the home economics and agricultural students who have entered or who are preparing to enter the work of the farm or farm home."

The school must provide for directed or supervised practice in agriculture on a farm for at least six months of the year. A project in agriculture is understood to be a productive, improvement, or demonstrational problem to be worked out by the pupil in agricultural lines, supervised by a teacher as part of his regular instructional work. The amount of money which each state receives is not less than $5,000, and an additional amount based upon the rural population of the state and the rural population of the United States. The amount is increased until the total appropriation reaches $3,000,000 in 1926 and the amount for the preparation of teachers is $1,000,000. Provisions are made for more efficient supervision as well as for better instruction.

Interpreting *Bulletin* No. 1, by the Federal Board for Vocational Agriculture, vocational training must be for the common wage earning employment. It may be given to boys and girls who have selected a vocation and desire preparation for entering the vocation as trained wage earners and to boys and girls who have already taken up wage earning employment and seek greater efficiency in that employment or to advance to positions of more responsibility. *Bulletin* No. 1 also states that there is provision made for two funds which relate to agricultural instruction. One fund provides for salaries of teachers, supervisors, and directors of agricultural subjects and one provides for training teachers, supervisors, and directors of agriculture. All schools receiving the Smith-Hughes money must be under public supervision or control. The purpose must be to prepare for useful employment. A portion of vocational education govern-

ment funds may be used to reimburse salaries of teachers who have met the standard set up by the State Boards.

There are two types of secondary schools of agriculture, the special which is a separate agricultural school and the department of agriculture in the regular high school. The special or separate agricultural school should have a farm of suitable size and equipment to give supervised practice to all pupils enrolled in agricultural courses, as well as a laboratory equipped to give instruction in related sciences. The project work should be done on these farms only in cases where the pupils have no land at home for project work. The department of agriculture in a high school should have a room equipped for the purpose of instruction in agriculture. It should have seats, tables, and chairs that can be moved from one place to another, in order to provide for demonstration with apparatus. It should have equipment sufficient to demonstrate ordinary efficient methods of testing milk, incubating eggs, grafting trees, use of machinery, etc. A suitable room for properly storing apparatus and properly caring for materials collected in the community, such as samples of grains, grasses, fruits, vegetables, feeds, etc., should be provided. The school should maintain a collection of up-to-date reference books and bulletins. These should be added to each year. A few good farm papers of general interest, for example, *The Breeders Gazette*, and *System on the Farm*, should be placed where the pupils may have access to them. The cost of equipment for twenty pupils would be determined by the laboratory work to be done. The farm mechanics equipment will be the most expensive. This should be added to each year.

Each school should provide sufficient funds for a well qualified teacher who should be employed twelve months per year. Each school should provide enough money to secure the needed material as well as to provide the teacher's trav-

eling expenses in supervising his projects and other community activities. It is suggested that schools start on a one year course to be increased in time to four years and that fifty per cent or more of the time be given to agricultural work. The State Boards use the term unit for this work, which means an hour's work a day for one semester. Science as well as other useful courses will vary in the different states under different conditions.

The qualifications of teachers of agriculture in the various states may be grouped under three types:

1. Instructors in farm work.
2. Instructors in agriculture and related science.
3. Instructors in academic subjects.

The teacher should have had a successful experience in farming. He should be a graduate of a standard college of agriculture. He should be a man who will command the respect of the farmers of the community. He should possess qualities of leadership. He should be in sympathy with the farmers in the community.

The qualifications of the supervisors and directors should be the same as that required for the agricultural teachers and they should have in addition, two years of successful experience in teaching or supervising agriculture. A supervisor or director should have made some special study in the general problems of vocational agriculture.

Pupils need the application of scientific principles which they are to learn. The home project is an enterprise undertaken by the pupil with full responsibility on his part both for financing the project and doing the work. It should be a business enterprise involving keeping the books, taking an inventory, and making a final statement. In addition, the project should contain certain home laboratory exercises, as testing milk, propagation of trees, etc.

It is understood that all vocational education in agricul-

ture should be supervised by those in charge of vocational schools of the state. It is suggested by some State Boards that the approximate time of the course for teachers, not including experience, be forty per cent agriculture, thirty per cent science, twenty per cent humanistic studies, as history and English, and ten per cent vocational subjects. Graduation requirements should include experience in fundamental farm operations, in practice in laboratory operations in the usual courses of a standard college, and in practice in carrying on a farm business or some special line of agriculture, as hog raising or fruit growing, as well as practice teaching work.

Each state has placed its own interpretation on the Smith-Hughes Act as a separate state plan. While the details of practically every state vary, the fundamentals remain the same.

NOTE. State plans of Smith-Hughes work quoted were taken from 1920-1921 Bulletins. The 1921-1922 Bulletins will contain some changes.

CHAPTER IV

HOW THE SMITH-HUGHES BILL OPERATES

The Smith-Hughes Bill operates through the Federal Board for Vocational Education at Washington, D. C. This is a special board created for this purpose, but it also directs carrying out the Smith-Sears Bill. In most states the Smith-Hughes Bill operates through the state board of education. The special agent of the state board is the state commissioner of vocational education. In some instances the president of the university is a member of the state board and in other states he is not. In many states there is a state supervisor of agricultural instruction. In some, as in Oklahoma, there has been created a state board for vocational education.

The various states agree upon the following general considerations as stated in the bill for Federal reimbursement:

1. The school must be under public supervision or control.
2. The controlling purpose of this instruction must be to fit the pupils for useful employment.
3. The courses in agriculture must be designed to meet the needs of persons over fourteen years of age, who have entered or who are preparing to enter upon the work of the farm or farm home.
4. The state must spend a dollar for every dollar of Federal funds used.
5. Reimbursements to schools are for salaries of teachers, supervisors, and directors of agriculture, who are properly qualified.

6. The local communities must provide laboratory facilities, class rooms, and for the supervision of the pupils' projects.

Vocational agriculture of a secondary nature is taught in most states as a department of the district or union high school. In some states, as Nebraska, agriculture is taught in different kinds of high schools as the county high schools, consolidated schools, rural high schools, town and city high schools. The qualifications of the teachers do not differ to any great extent. Most states require a graduate of an agricultural college for certification and some states, as California, require a fifth year's work. Practical farm experience is also desirable.

The training of teachers is under the direction of the state board which is responsible for the administration of the funds. The training is usually done through the state universities or colleges of agriculture. The unique feature about the plan in California for training teachers was conceived by Dr. E. R. Snyder, State Commissioner of Vocational Education. It was carried out through the University of California at Davis by the author in coöperation with the State Supervisor of Agricultural Instruction. This unique feature of short unit courses and project work in connection with training classes was efficient in preparing teachers in a short space of time. The number and kind of projects taken depend upon the previous experience and training of the student-teacher. In the spring of 1919, thirty-six projects were being conducted at one time, some of which were one-hundred-twenty-five laying hens, a sow and a litter of pigs, an acre of potatoes, harvesting and marketing fruit, and most all kinds of vegetables were grown ranging in area from one-fourth acre to an acre and a half, depending upon the crop grown. The project is carried on

in connection with the regular class room work where possible. The technical information is given the student-teacher by the division giving the class work. Student-teachers carry on projects in which they have had but little experience in order to become more efficient supervisors of high school projects later. These projects serve as an observation lesson to others who expect to teach vocational agriculture. They also serve as a basis for a large part of the class work in Methods of Teaching.

The reimbursement for teachers differs in the various states. In Michigan where they have twelve pupils to a teacher, the money is divided by units and pro rated. According to the state plans not over three-fourths of the salary is paid the teacher by the state board. In California where there may be twenty pupils to the teacher, the Smith-Hughes reimbursement is one-half of the teacher's salary up to $1,000 for the first year. In Nebraska teachers are allowed fifteen dollars per pupil for maintenance fund. In that state none but bona fide vocational agricultural students may be admitted to classes in vocational agriculture. The qualification for admission varies in different states. In California one-fourth of the class may be made up of other pupils who can qualify, providing the total number in class is not over twenty pupils. In Iowa at least ten pupils must sign up for the course before it can be given. Plans for reimbursement will gradually be adjusted as the work develops.

The instruction is largely given through the group or class as a whole. The type of teaching is being changed to individual instruction as rapidly as new teachers can be prepared. The purpose of the Federal Bill is to give the pupils such individual instruction as will best suit their needs. The instruction should be given from the standpoint of pro-

duction rather than from the standpoint of scientific investigation, if the state plans are carried out. The Massachusetts plan will soon prevail where the project is made the basis and the problems growing out of the project will be of such a nature that the work will be mostly individual instruction. The change in teaching methods will be gradual as those who have had this special training enter the work.

While the equipment will differ in different places, there is an attempt in many state plans to suggest a minimum amount. Not every school as yet has had an opportunity to fit a room or rooms primarily for agricultural instruction. This will, however, be done as soon as local school authorities have time to adjust the school to the agricultural needs.

The courses of instruction differ in different sections to suit the local conditions and to harmonize with the plan of those in charge of the work. For example, the Nebraska course of study is as follows:[1]

First Year

Live stock production and management.
Farm shop work and supervised home projects.

Second Year

Crop production and soil management.
Farm shop work (largely in connection with the project.)
Supervised home project.

Third Year

Poultry production and management or
Dairy production and management or
Other specialized live stock production and management or
Other special crop production and management.
Farm machinery, farm motors.
Supervised home project.

[1] Plans for Vocational Education in Nebraska, 1919-1920.

Fourth Year

Farm management.
Farm marketing.
Rural economics.
Rural sociology.
Farm accounting.
Farm management survey.
Supervised farm accounting project.

The schools operating under the Smith-Hughes Bill in California follow the State Course of Study[1] which is as follows:

First Year

Farm projects, farm mechanics	2 Units
Farm English	½ "
Farm application of science	½ "
Farm application of mathematics	½ "
Hygiene	¼ "
Citizenship	¼ "
Physical education	½ "

Second Year

Farm projects, farm mechanics	2 Units
Farm application of science	½ "
Farm application of mathematics	½ "
Hygiene	¼ "
Citizenship	¼ "
English and literature	½ "
Development of modern democracy and democracies	½ "
Physical education	½ "

Third Year

Farm projects, farm mechanics	2 Units
Farm application of science	½ "
Farm application of mathematics	½ "
Hygiene	¼ "

[1] *Bulletin* No. 23, California State Board of Education, p. 14.

Citizenship	¼ Units
English and literature	½ "
Development of the United States	½ "
Physical education	½ "

Fourth Year

Farm projects, farm mechanics	2 Units
Farm application of science	½ "
Farm home, and rural home and community life	½ "
Farm economics	½ "
Hygiene	¼ "
Citizenship	¼ "
English and literature	½ "
Physical education	½ "

The farm mechanics or farm shop courses as they are called in various states differ greatly in content and methods of presentation, depending upon the teacher's previous training and experience as well as upon the local needs of the pupils. These courses are often given in a separate building or in a room especially equipped for this work. More and more of the mechanical work is being done on the home farm in connection with the project, as the construction of poultry and hog houses.

There is a tendency to reorganize the courses in English and mathematics in order to make them fit into the everyday needs of the farm life and connect with the project activities. Other courses are also being revised and the dead wood is rapidly being eliminated.

The operation of the Smith-Hughes Bill is developing courses according to the seasonal sequence of the farm activities. With the new type of trained teachers, more time will be given to supervising the home project. This project work must be developed differently in different states. For example, vegetable crops could not be started until late in the spring in Illinois, while in southern California they can

be grown during the entire year. More time will necessarily be given in the spring to the project work when it is of such a nature that the actual project operations can not be done in the fall or winter.

With many of the educational forces experimenting with and analyzing the job of the teacher of vocational agriculture, and trying to measure his efficiency, more uniformity in his training and better methods of instruction are sure to follow. The results of the operation of the Smith-Hughes Bill are already being felt in adjusting the high school program. The individual method of instruction is going to be used in giving the pupils what they should have to make them better farmers and citizens. The operation of this Bill is also going to cause the colleges and universities to change their courses in order to make them more worth while, especially for those who expect to enter the activities of the farm and farm home.

CHAPTER V

THE HOME PROJECT

The project idea is the natural outgrowth of the great unrest in the school program, which had its beginning during the reconstruction period after the Civil War. Requests by parents were made to connect the school work more closely to the every day needs of the rural population. There was a continual demand for some part of the school work to really function in the every day activities of the pupils' lives. School gardens of various kinds were tried out to meet this demand.

Since Dr. David Snedden used the terms, project and home project, in 1908 in connection with his work, the credit for the beginning of real vocational agricultural projects is probably due him. Dr. R. W. Stimson, who became Director of Northampton School in Massachusetts and later the State Supervisor of Vocational Agriculture, developed the project idea in that state.

The home project in connection with the instruction, as shown by Dr. Stimson of Massachusetts, has come to be recognized as being superior to any other method of teaching. This method, when properly carried on, develops skill in carrying acts to completion. It also provides adequate opportunity for direct thinking and reasoning to the proper conclusion, based upon the experiences of the human race. It is probable that the term, "project method" is being overworked by some of our teachers of classics who dwell upon

theory alone, but certainly not by teachers of vocational agriculture.

The underlying principles of the Smith-Hughes Act had the project idea in mind in developing the type of instruction mentioned in the Act. The Smith-Hughes Act states that the vocational courses are designed to meet the needs of boys and girls who are over fourteen years of age and who are planning to enter the field of agricultural pursuits. The idea of giving the pupils project supervision in practical home work six months of the year has been another step in advance.

The term project means an undertaking by the pupil to conduct an agricultural enterprise on a commercial basis for a period of at least six months. The work is to be done under the supervision of the instructor. There are three kinds of projects: first, productive projects, as growing an acre of potatoes or beans, raising hogs or poultry, etc., on a commercially productive basis; second, improvement projects, as improving the yard or homestead; third, demonstrational projects, as growing a new variety of potatoes or growing potatoes to demonstrate the amount that can be produced on a given area.

A productive farm project should consist of the production and marketing of farm or garden crops, vineyard or orchard crops, hogs, sheep, beef cattle, poultry or the production and marketing of dairy or poultry products. Some of the requirements of the project are as follows:

1. It should be conducted on a commercial basis.

2. The contract should be a written agreement signed by the pupil, parent, and teacher stating what each is to do, so that there will be no misunderstanding.

3. The project should be of sufficient size to make it a business enterprise.

4. It should extend over a long period of time in order to get as many of the fundamental principles of the undertaking as is possible.

5. The pupil should purchase, unless otherwise stated in the contract, the seed for planting, or plants, and sacks or crates for marketing the crop.

6. If the project deals with hogs, calves or poultry, the stock should be purchased, if not already on hand, under the supervision of the teacher. (If dairy cattle are chosen, they are usually selected from the father's herd.)

7. Complete records should be kept of the project including such items as rent for teams, water, farm implements, land, and other equipment used in connection with the project.

8. The hours of labor should be recorded on the day the work is done.

9. The records should show the total expenses, the total amount of money received from the project, and the total labor income, the labor income per hour, the net profit or loss on the project.

10. A story of the project should be required by the instructor so that the pupil will organize the lessons he has learned.

Not infrequently does the young teacher over-emphasize the money value of the project to the detriment of its educational value. There is danger of the supervisor judging the teacher on the financial returns of the project instead of judging him by the benefits that the pupils have received in conducting the projects.

The essentials of any one of the three kinds of projects are as follows:

1. The definite purpose in view in which the pupil's financial considerations are concerned should be clearly stated in the agreement.

2. The instruction in school should be of such a nature that it will form an intelligent background for the work of the project as it is being done.

3. The teacher should supervise the project by giving the pupil the needed help and encouragement sufficiently to carry out the project to a successful conclusion.

4. Complete records should be kept of the inventory, cost of conducting the project including labor; expenses, receipts and value of the products on hand at the close of the project.

5. The story of the project submitted to the teacher should contain the lessons learned from conducting the project.

Many agricultural projects were first conducted on the school farm. Later they were transferred to the home or rented farms. Only a small per cent of the high schools in the United States own a school farm large enough for projects of many of the pupils. Where the school farm is used for this work, it is usually where the pupil has no land at home at his disposal. The main reason for the project idea being carried out on the home farm is that it combines the class room instruction with the practical farm operations. It gives the pupil an opportunity to try out his own ideas of farming. It is a finding course for many, thereby eliminating misfits of those who should engage in other pursuits. It has caused a reorganization of the high school curriculum, eliminating the non-essentials, and the pupils drink from a running stream. It has been a help to the parents for in many cases it is necessary for the pupil to make part of his own expenses while securing a high school education. The parents also indirectly receive the benefit of this instruction. The pupil finishing high school has had a practical education which fits him to earn a livelihood.

One of the greatest handicaps of successful project work has been in securing properly trained teachers. To successfully supervise the project, it requires one who has been technically trained in the latest methods of scientific agriculture, and who has had enough practical farm experience to successfully advise the pupils of the best methods to pursue. He must have the happy faculty of coöperating with the parents.

Supervising the project is the most difficult task of the teacher of vocational agriculture. One of the first problems is to become acquainted with the home conditions of the pupil. Before the project has been decided upon, it is necessary to know about the home conditions to be assured that there are facilities for carrying out the project. The equipment, soil conditions, climatic conditions, markets, inclination of the pupil and the attitude of the parents are all factors to be considered. No project ought to be started where there is a doubt in the teacher's mind as to whether it can be carried to a successful conclusion. Many times the pupil may become discouraged because financial returns are in the distant future, as, for example, in caring for an orchard. While projects are for their educational value, it is not good judgment on the part of the teacher to permit the pupil to select something that is expected to be a financial loss. As soon as the project has been definitely decided upon and the parents have agreed to the plan, it is the psychological time for the contract to be signed.

The inexperienced teacher will usually have a tendency to want the project to be too large. While no business enterprise that incurs a financial loss should be considered, the educational value is its main purpose and should be kept in the foreground. A teacher recently remarked that the income from any one of his pupils' fifteen projects was

sufficient to keep the pupil during the entire year. It is during the plastic period of the boy's high school career that he should be vitally concerned with the science underlying his practical work.

Another problem of the teacher is, what to do with the city boy, should he want to take vocational agriculture. In such case, this will be a finding course and he should have as much as possible of the farm practice work. Even though his business enterprise is conducted on a small scale, it should be well planned and carried to a logical conclusion.

The Massachusetts plan in starting with vegetable gardening, is a good idea. The boy may then go to the home flock of poultry for his next year's project. The following year he may take over a portion of the orchard or part of the dairy herd. The fourth year he will likely want to do the book-keeping of the entire farm and learn the managerial jobs connected with the enterprise.

Since in most states the teacher of agriculture has time for supervision, while the pupil is doing the work, he should give him the needed help called for. He should plan with the pupil, definitely what he is going to do and see that he gets the seeds planted, cultivation and irrigation well done at the proper time. The crop should usually be sold before it is harvested so that the teacher will not be embarrassed in helping the pupil find a market after the crop is harvested. He should be frank and honest with his pupils in all dealings. He should approach them in a business manner and keep in close touch with the project as it develops. One problem that the young teacher especially will find difficult in the beginning, is to gain the confidence of the pupil and the parents. Two good axioms to keep in mind are: first, know your subject; second, do not talk too much. Always be willing to answer any questions that may come up regarding

other activities of the farm. In case the teacher can not give the desired information, he should look it up and answer by letter.

It is better to have uniform projects for the different years where conditions warrant. The teacher must adapt himself to the local needs of the community and in doing so, different pupils may have to take different kinds of projects, even in the first year. The individual method of instruction is usually the type that fits best, so the teacher is not seriously handicapped. Where possible the project work should be directly connected with the class room instruction. This is not always practical as the pupil should have well balanced courses in English, mathematics, biological sciences, history, etc., as a background for agriculture. Much of the information obtained from the subjects is needed in solving the daily problems of his farm life.

While supervisors and teacher trainers are not all agreed on kinds and places of projects in high school work, there are some fundamental projects worth considering. A vegetable garden consisting of potatoes, lettuce, cabbage, beans, tomatoes, sweet corn, etc., either a half acre of each or a combination of crops will make a good first year project. A few acres of alfalfa or grain may be used where vegetables are not desired. A hundred or more hens make a very satisfactory project, but this fits better during the second year in connection with raising the green feed. Bees also make a good project. The number of colonies will depend upon the year in which the project is taken, and the pupil's facilities.

For the second year, raising baby chicks in poultry sections or a flock of poultry is very desirable for the project. Pigs, goats, sheep, calves, a few dairy cows, or a few beef cattle make a good second year project. Some educators advocate repair of farm machinery or improvement projects for the second year. Production projects seem to be

the most desirable for the first three years for their financial and educational training.

For the third year, fruit, a larger area of grain crops, more dairy cows, beef cattle, or hogs make a good project. This year there should be more specialization in particular crops and animals. Frequently the pupil may desire to carry over a project of the previous years and go more into detail and also increase the size of the project, which is highly commendable.

The fourth year projects may be a continuation of the previous year projects or they may be managerial projects consisting of keeping records of part or all of the farm. They may consist of replanning and improving the farm and farmstead.

The following essentials in supervision of the project are worth considering:

1. Have a definite plan.
2. Give some specific information at every visit.
3. Give the pupil an opportunity to ask questions.
4. Take time to give the pupil the needed information and if necessary by demonstration.
5. Visit the project as often as it is needed in order to keep the work up to a high standard.
6. Review the records at frequent intervals.
7. Plan the project so that it does not demand too much of the pupil's time.
8. When in doubt as to the pupil carrying out instructions, leave written assignments.
9. Give the pupil the opportunity to be original and to do his own thinking.
10. Encourage the pupil when he has difficult problems, to the extent that the project will not suffer even when adverse conditions arise.

Experience has shown that one of the weak points with

many teachers is that they do not properly supervise the pupil's projects. Arrangements should be made to provide adequate traveling expenses before the teacher signs his contract. High school principals are beginning to realize that the teacher of agriculture can not be over-loaded with other classes in the afternoons and give proper time to his field supervision.

The following are some of the benefits derived from home project work:

1. The pupil has an opportunity to put into practice the principles he has learned at school.
2. It is a finding course for the future occupation or profession of the pupil.
3. It teaches the pupil to appreciate the value of dollars in hours of labor.
4. It develops the pupil's initiative, by actually doing the work and solving new problems as they present themselves.
5. It teaches good business principles in financial dealings.
6. It gives the pupil a foundation for character building by having honest dealings with the business world.
7. The parents are also benefited by having the association of the teacher in discussing his agricultural problems.
8. The community is benefited by having a teacher who becomes the local farm advisor.

SELF-FEEDERS FOR HOGS. Lodi, California

WEIGHING THE PROJECT PIG
Salinas, California

PRUNING AN ORCHARD
Kingsbury, California

SCORING A PURE-BRED HORSE

JUDGING HOGS. Kingsbury, California

CHAPTER VI

PLANNING THE LESSON AND LESSON PLANS

The aim of education should be to better prepare for greater efficiency in doing that which our natural ability and inclinations are best suited to do. We should be prepared to follow some useful employment in which we can live a useful harmonious life, adapting ourselves to our surroundings. Society should permit no one to reach manhood or womanhood without being fitted for some useful employment. Thus education should prepare one physically, morally, socially, mentally, and vocationally for useful citizenship in a civilized society. John Dewey has said that social efficiency is selecting the experiences of the human race that are to be impressed upon the individual. Education then means a continual change in growth and development.

The lecture method has no place in high school work; the conversational method is best suited for the development of the adolescent mind. Field trips should be taken in order to get first hand information to aid the solution of the problems at hand. The purpose of the lesson plan is to think through the lesson so as to have a definite object in view. The best teachers have never reached the point where preparation for a day's work is unnecessary. The teacher should vary the method of approach or development as seems to suit the needs best. The beginner should follow a lesson plan closely and the motive should always be preserved. Illustrative

materials should be given and short trips taken when they are needed to make the work better understood. As an example, the class does not understand what the nodules on the alfalfa roots are and an alfalfa field is near the school house. At this point the teacher should take the class to the alfalfa field and there demonstrate the value of the nodules on the roots.

Have the class secure material when possible. As an example, a good beef animal may be brought to the school for judging purposes. When a pupil is asked to bring some illustrative material, he should never be disappointed; the material brought for this purpose should be used in class.

The blackboard serves a good purpose and teachers should become skillful in expressing their thoughts on the board, but should not use it to the sacrifice of the interest of the class. Pictures from books and laboratory material can frequently be used to good advantage in making a lesson clear.

The assignment should be a clear cut definite problem which needs solution. It should be made when needed to solve a problem which develops in the class and needs solution. At the end of the period the lesson may be assigned by putting it in the form of a problem needing solution for the next lesson. This problem will raise questions. By proper direction, living problems are constantly before the pupils in preparing their lessons as well as during the recitation. The problems should be real issues. The assignment should be definite as to what is expected and should not be too long. As an example, why are the markets demanding carefully graded and well packed apples? Keep the subject matter separate in planning, so that the whole topic can be covered. The teacher must think out the problems that might be raised so as to make the assignment when

the situation demands it during the recitation. One topic may last several days, but conclusions should be drawn as the work progresses. The subject matter should constantly be changed for no two groups of children have had exactly the same experience. There is no method of teaching that can take the place of a thorough knowledge of the material which bears upon a topic to be treated. It must be treated in such a way that the pupils will not only grow in knowledge, but also in the desire to inquire and investigate the power to satisfy their intellectual craving. After the teacher has in mind an abundance of instructive material, the next step is to organize the material to be presented. This can not be gotten from books for it too frequently has no relation to the needs of the particular problems of the class to be taught. The organization must take account of the child's point of view and responses to the needs for this material to be presented. This is what is meant by the psychological and logical method in presenting subject matter.

Good organization demands that the material selected be grouped around a few coördinate heads. For illustration, in developing the essentials for plant growth each essential can be developed and proven to be of value to the plant. A good plan will include pivotal questions which serve to recall the main topics in the main organization of the subject matter. The essentials of a good question are:

1. Is it thought provoking, pertaining to the subject?
2. Does it require previous knowledge and organization of material to think it out?
3. Does it bear direct thought toward the solution of the problem under consideration?

All questions can not be anticipated ahead of time, even when the lesson plan has been clearly thought through, but

it will be easier to intelligently guide the discussion of questions raised by the class. A few well prepared, well chosen questions prevent the class from wandering. A thought provoking question is directly dependent upon the teacher's aim in presenting the lesson. A frequent criticism of a lesson is, that the ground covered during the period can not be traced by the class at the end of the recitation.

Summaries should be worked in the lesson plan as soon as the main topics are covered. A real teacher summarizes his work as he passes from one point to the other. This is simply put in the form of a question to get a new view of the ground already covered.

Of the various kinds of lessons, namely—drill, inductive, deductive, review or examination, study lesson, recitation, student demonstration, and lessons for the appreciation, the inductive usually best suits the high school age. However, various kinds should be used when the occasion demands. As an example, a lesson may be given for appreciation when the class is studying some new song which illustrates some type of agriculture. A review lesson should be planned to better organize the material that has been presented and usually a class recitation is better for the purpose than too many written lessons.

PURPOSE

The purpose of the lesson plan is to have the material so arranged that it will be interesting and instructive to the pupil at the time it is given. In this way it will become part of his apperceptive basis. The plan gives the teacher his aim and keeps him from wandering too far from his particular subject. In working out the lesson plan, he is forced to think the subject through so that he understands what he is going to teach: it gives him a body of information for expression and gives him warmth of enthusiasm for the

lesson, so that his questions can be well arranged for a logical sequence. There may be five steps in a logical lesson plan. The five steps in the Herbartian lesson plan are probably the easiest of following through in a systematic way for better organization of the material to be utilized.

PREPARATION

"To prepare the pupil to reason in a given situation from the data in hand to the conclusion which of necessity will follow, it is first of all necessary that he should see that the situation presents a problem. We reason only when we have some aim or purpose which can be satisfied by this process. But if consciousness of aim or problem is at the foundation of this type of thinking, and if we are to deal with the class in groups, it is essential that the situation which involves the problem be made the common possession of all. The step of preparation presents these two problems to the teacher:—(1) To find a basis in experience already had or to provide the experience which involves the problem to be considered. (2) To make the pupil feel the necessity for the solution—that is, to make the problem vital to him." Any object or situation has meaning to us only as it connects itself with and can be interpreted by previous experience. In the preparation we aim to make the pupils conscious of the fact that there is an immediate problem which is within their grasp and which needs solution. The questions asked by the teacher will tend to throw light toward the solution of the problem at hand. The problem may need a solution before continuing the work; as an example, in one of the lessons given it is necessary to know something of the structure and care of eggs before we can properly grade them for marketing. In many cases the problem will not be solved in a single lesson. This should be made clear in the assignment for the following lesson. If we expect a

class to think, it is necessary to provide stimuli for that thinking. Any situation or object is called to a pupil's attention only as it communicates itself and is interpreted in terms of his previous experience.

PRESENTATION

"The full realization of the problem to be solved involves a consideration of data already at hand in experience. When we have the problem clearly in mind, we examine this experience more carefully to see what bearing it may have upon the solution, or we may gather data, observing more critically or more extensively, or experiment in such a manner as to involve the solution of our problem." [1] Sometimes the work of the teacher will consist in helping the pupils to recall their past experience and to apply it to the question at hand. At other times, when experience is lacking, the teacher must direct the pupils to the sources of data, guide them in their observations or experiments, or give them the data which will bear on the situation. Our ability to think logically upon any new topic is conditioned by our ability to see facts in new relations and to recognize our data with reference to the new problem. Not that we know the fact, but that we can use it, aids in our understanding of the lesson and in encouraging intelligent answers and not random guesses. As an example, the problem of finding the area of a cylinder may not be understood, but when it is finding the capacity of a silo in order to determine the amount of silage it will hold, it presents an entirely different problem. In animal husbandry, the term "dual purpose" will only be clearly understood when we find it can be applied to many different kinds of animals. Pupils need direction in observation so as to drink from running streams and to eliminate dead wood from living material. The teacher must

[1] Strayer: *A Brief Course in the Teaching Process.*

have clearly defined in his own mind the purpose of the lesson.

COMPARISON

"With the problem clearly defined and the data provided, the next step consists of comparison and the resulting abstraction of the element present in all of the cases which make for the solution of the problem. In the ordinary course of our thinking, we find ourselves in a situation which presents a problem that demands an adjustment. . . . We formulate an hypothesis which furnishes the basis for our work in attempting to solve the problem; we gather data in the light of the hypothesis assumed, which through comparison and abstraction lead us to believe our hypothesis correct or false. If the hypothesis seems justified by the data gathered, it is further tested by an appeal to experience. That is, we endeavor to see whether our conclusion holds in all cases. Often many inferences will be necessary before we succeed in finding the one that will stand the test. If this test proves satisfactory we generalize or define. Lastly this generalization or definition is used as a point of reference or truth to guide in later thinking or activity."

GENERALIZATION

"We feel that we have solved the problem when we are ready to state our generalization. One can never be quite sure that he has solved his problem until he finds himself able to state clearly the results of his thinking. . . . Pupils should be encouraged to give their own definition or generalization before referring to that which is provided by the teacher or the book." The significance of a generalization for further thinking or future work depends upon the substitution of words for thoughts and upon adequate realization of the significance of the conclusions reached.

APPLICATION

"Whatever conclusions we have reached, whatever truth we have satisfactorily established, influences us in our later thought and action. The application makes clear the truth itself and helps to fix it in the mind." The conclusion arrived at to-day is chiefly significant as a basis of our thinking of to-morrow and it is as we apply our conclusions that new problems arise to stimulate us to further thought and intellectual activity. The true teacher provides for the application of every lesson to the daily life of the child, so that to his apperceptive basis are continually added new thoughts and ideas which will make him more efficient in his future development.

LESSONS PLANS

Larger Problem:	Vegetable Gardening.
Special Problem:	Preparation for planting sweet corn.
Teacher's Aim:	To show the pupils that a well prepared seed bed is essential for sweet corn.
Pupils' Aim:	To understand why it is necessary to have a well prepared seed bed for sweet corn.
References:	*Productive Vegetable Gardening*—Lloyd, pp. 212-213. *Farmers' Bulletin*, 937.
Preparation:	In what ways have you noticed land being prepared for sweet corn? Why this variation in preparation of land, depth of plowing, and fertilizer used?

Presentation:	*Pivotal Questions*
What the seed bed is. Preparation of the seed bed. Why the seed bed is important.	What is the most desirable time in the year to plow for sweet corn? Under what conditions does this vary? To what extent does the depth of plowing influence the yield of sweet corn? In some instances the ground is cultivated many times, while in others only once. Why should you expect this to make a difference in the crop? Are there any reasons for plowing some soil ten inches deep and other soil only five inches?
Fertilizers.	To what extent does fertilizer increase the yield of sweet corn? What are the determining factors in the preparation of the seed bed? What influence does the variety of corn have upon the preparation of the seed bed? Under what conditions is irrigation desirable before the crop is planted? What are the best methods of improving the soil for this crop?
Comparison:	Compare the preparation of the seed bed for sweet corn with that of other garden crops. Why this difference?
Generalization:	What are the conditions influencing the preparation of the seed bed? To what extent is the climate a factor? To what extent is the soil an influencing factor?

Application:	In what way will knowing how to properly prepare the seed bed help you in your home garden or project work?
Larger Problem:	Field crops.
Special Problem:	Harvesting alfalfa.
Teacher's Aim:	To emphasize the best methods of harvesting alfalfa.
Pupils' Aim:	To determine the best methods of harvesting alfalfa.
References:	*Field Crops*—Wilson and Warburton, pp. 383-385. *Alfalfa in Kansas*—Kansas State Board of Agriculture, pp. 118, 137, 241, 248, 305, 330, 439, 472.
Preparation:	(Previous lesson was a discussion of methods of irrigating alfalfa.) How does the farmer tell when to cut alfalfa? What different methods have you seen used in harvesting the crop? What machinery used?
Presentation:	*Pivotal Questions*
When to cut alfalfa.	When should alfalfa be cut for hay? When should it be cut for seed? What is likely to be the effect on the hay if cut too early or too late? Compare the machine used for each operation with the best type to use. Describe the way the crop should be handled in harvesting. What are the essentials in harvesting alfalfa? Why does the crop often spoil? Why do some farmers bale the crop and others feed the alfalfa loose?
Importance of proper time of cutting.	
Methods of cutting.	
Handling the crop.	

Comparison:	Compare the common practices used in harvesting with the best methods to use.
Generalization:	How should alfalfa be harvested? What are the advantages in using the most scientific methods?
Application:	How will this information aid you in harvesting your alfalfa project crop or the alfalfa crop on your home farm?
Larger Problem:	Poultry Husbandry.
Special Problem:	Poultry Feeding.
Teacher's Aim:	To show the proper feeds to increase egg production.
Pupils' Aim:	To determine the most economical feeds for feeding laying hens.
References:	*Poultry Keeping*—Lewis, Chap. 25. *Productive Poultry Husbandry*—Lewis, Chap. 12. *The Essentials of Poultry Raising* — Kaupp, Chap. 12.
Preparation:	What kinds of feeds are fed to chickens? If a mixture of grain has been fed, what did it contain? What kind of feed do chickens seem to relish most?
Presentation:	*Pivotal Questions*
Maintenance.	Why do we feed more hard feed to laying hens than to most animals?
Eggs.	Grit seems to be necessary for best results, why? What feeds does
Protein.	the hen need for a maintenance ration? Since the egg, beside the

Carbohydrate (green feed).

Mineral (shell, grit).

Balancing the ration.

shell, contains 40 per cent fat, 50 per cent solid matter, and 3 per cent ash, what should we feed to produce eggs? Why is sunflower seed added to the feed? Since shell is found in the self feeder, what is its function in egg production? Since green feed is largely water, why do the rustling hens relish it? What kinds of feeds contain a large amount of protein, and what kinds contain a large amount of carbohydrate? Do you think the hen needs any other feed, if so, for what? (Show samples of various kinds of feed for the class to observe at first hand; show sample mixtures of various home and commercial feeds.) How can we find out what feeds the hen would eat, if she had her choice? How do we know how much water she would drink? How much grain should be fed to 100 pounds of mash? What are the determining factors in feeding laying hens? In what way has this information aided in mixing commercial feeds for laying hens?

Comparison: Compare the feeds used for the laying hen with those used for fattening chickens. Also compare them with those used for growing stock. Why this difference?

Generalization: How much and what kinds of feed would you give 100 White Leghorn hens per day?

Application: In what way is the poultryman benefited by knowing the most economical kind and amount of different feeds that his hens should have to produce eggs? How can this be applied to your poultry project?

Assignment: For to-morrow find out the most economical feeds and amount that you will need of each for the laying hens in your home flock, or in your poultry project.

Larger Problem: Poultry Husbandry.

Special Problem: Egg Production.

Teacher's Aim: To teach the pupils that it pays to market high priced eggs.

Pupils' Aim: To prepare and select eggs to bring the highest prices.

References: *The Essentials of Poultry Raising*—Kaupp, pp. 11, 75-80. *Poultry Keeping*—Lewis, pp. 282, 432-434. *Productive Poultry Husbandry* — Lewis, pp. 287-291, 428–443.

Preparation: How do eggs that you have seen compare in size, color, and cleanliness, when gathered from the nest? How do you prepare your eggs for market?

Presentation: *Pivotal Questions*

Grade of eggs. To what extent does the color effect the price of eggs? Why does this

Market demand. How to get high priced eggs.	vary in the Chicago and Boston market? How does this influence the popularity of the American breeds of poultry in many places? Why do many successful poultrymen cull out hens that lay small or odd shaped eggs? (Show to class samples of various shaped eggs.) What effect would it likely have on the market, if hens were bred and selected for a uniform lay during the entire year instead of trying to force them to lay more during the winter months? What is the effect on the price of candling and grading market eggs? To what extent does one's reputation influence the price he receives?
Comparison:	Compare the prices received for eggs and their care and methods of handling by the average farmer with the price, care, and methods of handling by the most up-to-date poultryman. Why this difference?
Generalization:	About what per cent more does the up-to-date poultryman receive for his eggs? Why then is it that the farmer does not take more pains in preparing and marketing his eggs?
Application:	What factors enter into the selection, grading, and marketing of eggs? How will the things learned in to-day's lesson help you in your project or in marketing eggs from your home flock?

Larger Problem:	Dairy Cattle.
Special Problem:	The best type of dairy cow for this section.
Teacher's Aim:	To show that the Holstein is the best type of dairy cattle for this section.
Pupils' Aim:	To determine the best breed of dairy cows for the project.
References:	*Productive Dairy Husbandry* — Washburn, Chap. 7. *Types and Breeds of Farm Animals*—Plumb, p. 269. *Dairy Farming*—Eckles and Warren, pp. 17-24.
Preparation:	(The previous lesson was a discussion of dairy breeds of cattle.) What do you know of the different kinds of dairy cattle? Why are there several dairy breeds in this section?
Presentation:	*Pivotal Questions*
Reasons for selection of the best type for this section.	Why do we study a certain type of dairy cow for a certain section? Under what conditions did the Holstein cattle develop? Compare these conditions with those under which the Jersey and Guernsey developed. Then compare with our own conditions. Why is the Holstein a popular breed in many places? What is the most striking characteristic of the Holstein breed? What is the reason for its being the chosen breed in many places? What rating does it hold
Characteristics of the breed.	
The products.	

	as a milk producer? What quality and quantity of milk does it give? What rating does it hold as a butter producer? What rating does it hold as a beef producer? Why are the calves in great demand?
Comparison:	Compare the Holstein cow with the Jersey and Guernsey as a milk producer. Compare the Holstein with the Shorthorn as a beef producer.
Generalization:	Why keep Holstein cattle?
Application:	Notice the cattle in this section and compare them with what you have learned about the Holstein. At home or on some farm where Holsteins are kept, notice the quality and quantity of milk given by them. How will this information help in selecting dairy cows for the project work?
Larger Problem:	Marketing fruit.
Special Problem:	Marketing apples.
Teacher's Aim:	To show that there is a large margin between the price the grower receives and what the consumer pays for market apples.
Pupils' Aim:	To understand the reasons for the excessive cost in marketing fruit.
References:	*California Fruits*—Wickson, pp. 208-210. *Modern Methods of Marketing Fruit*—Brown, Chap. 3.

Preparation:	Why has the apple development increased during the last few years? What are the difficulties in raising fruit? If insects and diseases were well under control, what then from your experience would be our greatest problem?
Presentation:	*Pivotal Questions*
Time of picking. Relation to market.	What determines the time of picking apples? What are the influencing factors in marketing apples? To what extent does a reputation influence the price of fruit? What
Market methods.	are the elements of success in marketing fruit? Why does fruit
Comparison of markets.	raised in the west shipped to the east bring the same price that it does in the west? What should be the comparative difference in price in San Francisco and Chicago?
Comparison:	Compare the cost of marketing apples with the cost of other perishable products. Compare the different methods of handling fruit in regard to efficiency in marketing.
Generalization:	What is the conclusion of large growers of apples regarding the better market? In what ways can marketing systems be improved?
Application:	What benefits do the fruit growers derive from making a study of the market problems?
Larger Problem:	Irrigation.
Special Problem:	Irrigation of alfalfa.

Teacher's Aim:	To explain the methods of irrigating alfalfa and to show their adaptability.
Pupils' Aim:	To determine the method of irrigating alfalfa best suited to local conditions.
References:	*Irrigation and Drainage*—King, pp. 338, 345, 352. *Farmers Bulletin*, No. 864, U. S. Dept. of Agriculture. *Farmers Bulletin*, No. 865, U. S. Dept. of Agriculture.
Preparation:	(Previous lessons covered surveying for irrigation, leveling, checking, and water supply.) What methods have you noticed used in irrigating alfalfa?
Presentation:	*Pivotal Questions*
Water requirements.	What kind of root does alfalfa have? What is a water table? How may it affect alfalfa?
Systems of irrigation, check for border flooding, furrow, portable pipe.	Name four systems of irrigation adapted to alfalfa. Describe each system.
Adaptability of each system, soil, topography water supply.	To what conditions is each system adaptable? What factors influence the system used? Which system do you think would suit your conditions best? Why?
Comparison:	Compare the different systems in the community for irrigating alfalfa.

Generalization:	What systems are best adapted for irrigating alfalfa in the community? For other crops?
Application:	How can the results of this lesson be applied to your own farm or project work?
Larger Problem:	Wool production.
Special Problem:	Characteristics of wool.
Teacher's Aim:	To show the characteristics of wool.
Pupils' Aim:	To recognize the kind of wool best to produce.
References:	*Feeding and Management of Live Stock*—Shaw, p. 11. *Farm Animals*—Wilcox, p. 238-286. *Manual of Farm Animals*—Harper, pp. 359-376.
Preparation:	To what extent is wool produced in this section? Why is it worth while to know the characteristics of wool?

Presentation:

	Pivotal Questions
Presence of oil or yolk.	What causes the fibers to be strong and elastic?
Length of staples ½ to 18 in.	Why does length of fiber vary with the breed?
Thickness or density.	Upon what does the weight of wool depend?
Number of fibers 5,000 to 48,000 per sq. inch.	
Crimp or curl.	What causes crimp or curl?
30 waves in an inch in length of very fine wool, caused by thickness of	Why should they be regular in appearance?

cortical layer, first on one side then on the other.	
Softness.	What influences softness of wool?
Color in the staple, white, rich yellow, orange, black; lustrous in all cases.	Of what is color an important indication? Why?
Style or quality.	What makes up the quality of wool?
Uniformity in fineness, length, density.	To what has uniformity reference?
Closure of fleece—glueing of ends together to form crust; impervious to rain, protection against dust, confined to fine wool breeds.	What is closure of fleece? (Show samples of good wool.) Why is this considered a good quality or characteristic of wool?
Felty wool, absence of yolk. Discoloration. Lack of wave or crimp.	What causes felty wool?
Comparison:	Compare wool of different breeds as to leading characteristics.
Generalization:	What are the most important of the characteristics of wool?
Application:	How will knowing these characteristics help in the selection of a breed of sheep to be used for wool production?

CHAPTER VII

THE FIELD AND LABORATORY WORK

The field trip is one of the most perplexing problems for the inexperienced teacher. The trip should be made whenever it is necessary to better understand some phase of the work that can be seen in the community. As an example, Mr. Jones has some pure-bred Shorthorn cattle; the class has been studying the characteristics of pure-bred Shorthorns; then the trip should be made to see his stock and compare with the ideal the pupils may have in mind.

The trip should be planned by the teacher several days in advance. He should first visit the farm and familiarize himself with the herd, the method of getting there, the distance, and make arrangements with Mr. Jones or his herdsman so that some one who is familiar with the herd will be there when the trip is made by the class. If the owner objects, the teacher should not insist on having his class make the trip. On the other hand, if the teacher approaches Mr. Jones in the proper manner, he will always be glad to give out any information when it is for educational purposes. By going over the field and getting the proper consent of the owner or manager and telling him the purpose of the trip, much better results can be accomplished. It is always desirable to go and come on time. The teacher should insist that the pupils do not ask impertinent questions and that unbecoming remarks are not made about the herd while the class is inspecting the same.

If the teacher goes with the pupils to judge, he may give

them a demonstration, but he must use tact in his discussions. If a trip is to be made to give a demonstration of pruning in Mr. Smith's apple orchard, it should be planned in the same way, by having made definite arrangements before the trip is taken. By having a specific purpose, making an outline which the pupils should take with them, and having a short but definite report upon the return, much is gained. No trip should be taken out of curiosity or to fill in time, but because it is needed to make the work at hand better understood. Each pupil should have some definite problem in which he is interested, otherwise he should be left at the school instead of going on the field trip. The time to take trips is near the beginning of a new study, so as to form a general impression for the apperceptive basis of the pupil to be used in the future development of the particular subject at hand. Many good teachers of vocational agriculture visit the better herds, larger manufacturing establishments, and special enterprises of the community during the school year. This is highly desirable. Not infrequently the teacher may have a set date each week for a field trip. This method is not to be recommended, for the trip should come at the beginning of the subject when it will make the work better understood; also, when it fits in with the time of the owner or manager as well.

The method of conducting a field trip should be rather definite. Before going, instruction should be given regarding the manner of conduct on the road and after reaching the destination. The work should be conducted with as little friction as possible. While iron clad rules should not be made, good order and intelligent questions only should be permitted. Upon return a written report should be made and handed to the teacher or placed in the note book until the next regular meeting of the class. In going on a trip it is not desirable to have too many things in mind to see. For

example, a teacher once took his class to the International Show at Chicago and tried to have the class see everything in the show. The following day when asked by another teacher to write about the trip, only two of the class of fifteen chose the same subject. The next year he took another class for the purpose of judging live stock. When he returned he found that the second class had accomplished the specific purpose. This is usually the case. While side trips are frequently made, every trip should have an object in view. It sometimes happens that it is desirable to visit a commercial concern which is of importance in the community. Care should be taken in planning such trips to see that there is not too much time spent by the manager in advertising his own particular products. In many cases the teacher pilots the pupils and the specialist makes the explanations. The information gained in this way is often used as a basis for future discussions.

Plan your work and work your plan in making a trip worth while. Correlate the results accomplished with the class work then in progress. Never make a trip unless there is a special object in view, and upon the return be sure that the pupils have gotten enough from the trip to make it worth while.

The tendency of all science work in the high school is to have part of it done in the laboratory. Many pupils who can not understand the particular workings of a part of a plant or animal can do so perfectly well when they see and analyze it in the laboratory. The eye is the great factor in making final impressions. With an up-to-date teacher, about one-third of the entire work consists of laboratory exercises and demonstrations.

The methods used in the laboratory will vary with the teacher, but some fundamental principles should be considered, if the best results are to be obtained. The methods

of presenting this type of work should be clear cut, in that a definite system should be followed. Most authors say the problem should be stated and material to use should be clearly set forth, then directions for doing the work should be given. The exercises and experiments should be written up in brief and concise statements as soon as they have been performed. The conclusions should also be made in a few short sentences. It is desirable, where possible, to have the pupils collect their own material. Not infrequently will a teacher give class demonstrations after which the individual pupils will perform the various exercises and experiments.

The teacher's place is to be in the laboratory while the work is being done. The class should refrain from loud conversation and from moving promiscuously about the room except when going or coming from the particular work. Not a few teachers have had serious difficulty in handling the laboratory work on account of having been lax in the beginning. There is also another side, where the pupils are held to a close routine which curbs their initiative as well as causes them to form a bad impression of the work and of the teacher.

Every drawing that is made in the laboratory should be a clear, distinct sketch, bringing out the point that it is intended to show and should be neatly labeled. Shaded drawings for the sake of artistic display have no place in the vocational laboratory. Neatness and accuracy should be insisted upon in every exercise that is made. When it is necessary to make an explanation to the entire class, it should be done at the beginning or at a stated time in order that the work of the class will not be interrupted. For example, in candling and examining eggs in order to find out how eggs look at different stages of development, explanation should first be made to the entire class and general ques-

tions, if any should be answered. The exercises should be written on a sheet of paper and handed to the pupils or written on the board. They should state the object, material to be used, method of procedure, and have space for the conclusion. As an example, if the exercise is to examine eggs and observe the contents, the pupils should candle and afterwards break and examine the eggs in an orderly way, after which the drawings should be made, labeled, and notes neatly written for the laboratory note book.

In grading the work in laboratory, great care should be taken to see that it has been properly done. The teacher should spend at least a few minutes of the period in looking over the note book in the pupil's presence. He should point out wherein it is not well done and give the pupil an opportunity to correct his errors or else grade him accordingly. The note books should not be removed from the room for the sake of grading them. This should be done by the teacher before the class is dismissed. The grades should be recorded in the pupil's presence and the teacher's O.K. placed on each sheet. The sheets should then be numbered and placed in the pupil's note book. In case of absence the work should, if possible, be made up in the presence of the teacher. All laboratory notes as well as the field trip "write up" should be kept until the close of the school year.

CHAPTER VIII

FIRST YEAR AGRICULTURE

Experience thus far seems to indicate that the best results in vocational agriculture can be accomplished by grouping the first year's work around the plant life and the second year's work around the animal industry. Begin the first year's work with a simple question, as Why do we study agriculture? or, To what extent are we dependent upon the products of agriculture? What are the importance and possibilities of the agricultural development in the community with reference to vegetables, farm crops, or fruit as the case may be? From the above questions we will get into a discussion of the plants' usefulness. This discussion, if carefully directed, will lead us to consider the pupil's proposed project. Before a final decision is reached, we should consider the soil and climatic conditions, the cost of production, possible returns, or use of the product, the market conditions, equipment at his disposal, time available, and what the parents or guardians may have to say regarding the pupil's proposed project. Not infrequently, it may take a few weeks for the pupil to come to a conclusion, but a project should be selected with every course in agriculture. While the pupil's enterprise should be the basis for this course, it should be broad enough to cover the phases of plant life in the community.

One of the most difficult points in teaching this course is to give the individual instruction at the time the pupils need the instruction to apply to their projects as they develop.

It is a mistaken idea to give only such work as will have a direct bearing on the project for the pupils will need information about other forms of plant life, if they are to become successful agriculturalists.

A lead pencil may be used to demonstrate the fields of science. If the pencil is broken, it opens the field for a study of physics. If it is burned, it opens the field for a study of chemistry. Wood is in the field of botany and lead in the field of geology. Any plant selected for this work is made up of various chemical elements, a study of which will bring us into the field of chemistry. So we find ourselves studying this subject as it is related to agriculture. For example, we learn that nitrogen aids in plant growth and we find ourselves studying nitrogen through its various compounds until it is ready to enter the plant; or in studying the element, carbon, it may take us into the process of vegetable matter slowly decaying and finally becoming coal; or so far as we need to go in order to make the element, carbon, understood. This plan may be followed out with the necessary elements that go to make up plant food.

After studying the composition of the plant food elements found in the soil as well as in the air, we find that the plant must have a home, which brings us into the field of agronomy. We should then want to know how soil is formed, in that it is continually changing and what effect these changes have upon agricultural products. We find that the structures of plants differ, which brings us into the field of botany. By using the most common economical plants for special study, the work will be better understood. For example, in studying the function of stems, it may be visualized by studying their importance in the lumber industry. In communities where forestry is the chief industry, the class should make a trip to see the method of cutting trees, visit the saw mill, planing mill and lumber fac-

tories in order to see the process of manufacturing logs into their finished products. The method of reforesting and its effect upon agricultural products of the community may be briefly considered. A better example, where the project is in grain sorghum, is a study of cutting it and blowing it into the silo. This would not only lead to the consideration of the structure and use of the stem, but also to the consideration of the chemical process of changing the green crop into silage. This would necessitate the study of the silo at this point.

The reason for continued cultivation or fallowing will also need to be considered. The reasons why deep cultivation at first and shallow cultivation later, as in the case of growing sweet corn, for example, will need to be understood. This study is necessary in order to know the time and depth of plowing and cultivation. Since in many places it is necessary to control the moisture content of the soil, which the crops need, some soil will want to be cultivated deep while other soil will want to be cultivated shallow. The season of the year may also affect cultivation. The pupil will need to understand why some soil can not be cultivated while it is wet and why the moisture content differs. Since some crops, as alfalfa for example, need much water, science and methods of irrigation will need to be considered in order that soil moisture will not be the limiting factor in plant production.

In observing the development of the project, we will likely find some abnormal growth which may be a disease, the study of which will lead into plant pathology. Or it may be that some insect is present, in which case we would need to study the source of the trouble. This would bring us into the study of entomology as it is related to plant life. We will need to study other diseases and insects in order to control the ones under consideration. In this way the

first year's work will be broader than the project. It will be found that the growth of some plants will be retarded by other agencies which will need to be considered. Growing plants are changing in size, shape, and color. From the difference in plant development, we should go into the study of the causes of these changes and the effects of environment. Since plants differ in different localities, we find a need for selecting those best suited to our community and the necessity of bettering present conditions by rotation, selection, and other improvements.

In studying the structure of the leaf, we will find that some are palatable and are used for human consumption, as that of the lettuce, and some for animal food as that of alfalfa, while others as those of the fruit trees are used for a different purpose. This study brings us to consider the purpose for which various plants are grown and to study their development. This will offer a foundation for the needed improvement of plants, as varieties of barley, corn and other crops.

The study of flowers is necessary in order to understand pollenization. As an example, in the various varieties of clover, the bee is a great factor in pollinization. In some fruits, as figs and almonds, it is necessary to have different varieties grown close enough together for cross pollinization. This is especially true in several crops over a small area, which may cause cross pollinization and spoil the pure bred product, as in the case of planting different varieties of corn close together. The fruits of various plants offer a good field for observation, for it is by careful selection that the production of wheat and oats, for example, has been increased many fold by selecting the best for seed. In some cases the products are used for many purposes, as the products of Indian corn, so that a certain part will need to be developed at the expense of the others. The seeds or

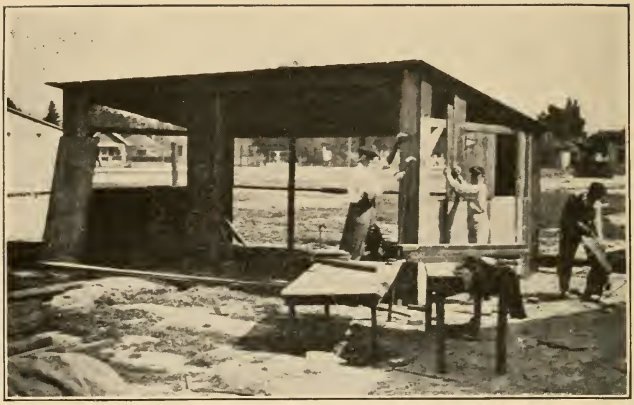
matured fruit, as the case may be, will need to be studied before the value of the market product can be obtained.

Canneries should be visited in connection with the marketing of vegetables and fruits. In studying marketing of fruits a trip should be made to a commercial orchard if possible to see the process of picking, grading, packing, and preparation for market as well as any special process that is being done in a scientific way. Evaporation or drying process should also be studied in connection with fruits. In studying the seed the milling process would be better understood by visiting a large milling plant in order to see the process of the grain from the time it reaches the mill until it is manufactured into the finished products. This will lead to the study of the applications of commercial manufacturing and physical sciences to these particular industries.

One of the most important aspects of the plant industry is the science of distribution. The economical factors influencing the price offer a greater field for thought than most any other phase of agriculture. It becomes necessary to study the development and influencing factors of foreign countries, the crop failures from year to year and the improvement and breeding of new varieties in order to arrive at a general understanding of the factors which determine the price one is to receive for his market products. Under and over production as well as speculation have a direct influence on the supply and demand of any particular product.

The project may consist of growing any one or more of the various field or vegetable crops, or caring for and harvesting fruit, etc. While the project is used for the basis of this course, sciences are helping to illuminate the particular problems which are being considered. The work is developed by the problem method to the point where it will often be individual instruction grouped around the pupil's particular

A TEN-ACRE CLOVER PROJECT. Rollo, Illinois



STARTING A POULTRY PROJECT IN A CALIFORNIA HIGH SCHOOL

A PRUNING DEMONSTRATION
San Juan Union High School, California

project. This individual instruction will consist of following the particular crop or crops that the pupil is growing from planting to harvesting time. The pupil will go into the various phases of science in order to solve the particular problem at hand. Care should be taken to see that a solution is found for the problems as they present themselves, so that the pupils will gain confidence in the work they are doing. They must learn to profit from the experiences of others in working their particular projects. In this way they will benefit by the experiences of the human race, instead of by the rule of thumb which has been practiced by a large number of farmers for many generations. They will begin to find out the various uses for their products. Since in modern methods of farming, emphasis is placed upon marketing the crop through live stock in order to maintain a permanent system of agriculture, they will have developed a need for a knowledge of the animal industry.

Probably the greatest need in teaching these courses, is for the teacher to have a thorough preparation with the proper viewpoint. This is not possible without having better methods of teaching than have heretofore been put into practice in our schools. The adolescent mind is adapted to the conversational method of teaching. There should be an abundance of field and laboratory work. The ideal method for teaching these courses would be to have plenty of time to be used at the discretion of the teacher. It is probable that two periods per day is not too much for these courses including the study period. One period per week may often be used for field trips and demonstrations. It is preferable to have the field trip precede the other work after a brief explanation has been given.

These courses require more skill in presenting than any other courses in vocational agriculture, because there are more places where the teacher may be side-tracked or not

have his material organized in such a way that it can be grouped around the project and be useful to the pupil in his every day work with plant and animal life.

OUTLINE FOR FIRST YEAR AGRICULTURE

The project when selected should be used as a basis for the course after the general considerations have been made.)

I. Introduction.
   - A. Relative importance of the crop selected, in United States, in the community.
   - B. Crop records of the field selected.
   - C. Needs of the crop, available water supply, drainage, fertilizer, seed, implements, team or tractor, and labor.
   - D. Market demands, prices expected, facilities.

II. Soil Considerations and Plant Growth.
   - A. Factors influencing weather conditions, as altitude, wind, rain, and frost.
   - B. Factors influencing soil conditions, as formation and transportation; work of heat, wind, water, plants, and animals.
   - C. How affected by physical conditions, as texture, structure, organic matter, water content, and temperature.
   - D. How soil conditions may be improved, as by addition of nitrogen, potash, phosphorous, lime, barn yard manures, and green manure crops.
   - E. Kind and amount of fertilizer needed for crop.
   - F. Necessary plant food elements and the form they are in when absorbed by the plant.
   - G. Preparation of seed bed; plowing, harrowing and discing; time and depth. Reason for cultivation before seed is grown. Other preparation soil may need.

III. Preparation of Seed.
   - A. Variety best suited to the community.
   - B. Treatment and testing before planting.

C. Time and amount to sow, method of sowing.
D. Test for starch and oil.
E. Requirements for germination and growth.

IV. The Growing Plant.
A. The root system, how food enters the plant.
B. Parts of plant and uses of each.

V. Cultivation.
A. Reasons for.
B. Frequency and depth.
C. Methods.
D. Determining factors.
E. Implements used.

VI. Irrigation and Drainage (where needed).
A. Reasons for, why certain soils vary in amount needed.
B. Methods, frequency and amount of water needed.
C. Why drainage is necessary.

VII. Enemies.
A. Insects, diseases and weeds.
B. Life history and methods of control.

VIII. Selecting Seed.
A. Methods, characteristics of parent plant.
B. Characteristics of seed desired.
C. Under what conditions stored.
D. Value of good seed.
E. Methods of breeding and selecting for better seed.

IX. Harvesting.
A. Time to harvest.
B. Chemical change that takes place.
C. Methods of harvesting.
D. Implements and machinery used.
E. Purpose for which crop is used.

X. Marketing.
- A. Condition of the crop which influences the price.
- B. Methods of marketing.
- C. Storage.
- D. Outlook of the crop.

References.

Soil and Plant Life by Mosier.
Productive Farm Crops by Montgomery.
Principles of Agronomy by Harris and Stewart.
Farm Horticulture by Hood.

ALFALFA

(Crop for hay, forage, or seed.)

I. Introduction.
- A. Importance of the alfalfa crop.
- B. Some alfalfa history (introduction into United States and state).
- C. Value as a soil builder.
- D. Place in crop rotation.
- E. The future of the alfalfa crop.

II. Soil Conditions.
- A. Character and condition of the soil.
- B. Essentials for success in starting alfalfa. (Inoculation, if necessary.)
- C. Testing for acidity (use of lime).

III. Seed.
- A. Selecting good variety.
- B. Method of securing the seed.
- C. Germination test.
- D. Amount of seed to sow to the acre.

IV. Preparation of the Seed Bed.
- A. Plowing, harrowing, discing, times, and depth.
- B. The importance of a finely pulverized seed bed.

V. Sowing the Seed.
- A. Time and method.
- B. Rolling after sowing.

VI. Irrigation.
   A. Methods, amount of water to use, and frequency.

VII. Enemies.
   A. Appearance.
   B. Life history and control of important ones.

VIII. Harvesting.
   A. Improvement of machinery.
   B. Time to harvest for hay, seed.
   C. Methods of harvesting.
   D. Baling, storing.

IX. Value of the Crop as Feed for Animals, as Soil Improver.

X. Marketing.
   A. Value of feeding on the farm.
   B. Yields and profit expected.

CHAPTER IX

SECOND YEAR AGRICULTURE

While the project animals selected form the core around which the second year's work is grouped, it is expected that the pupils will have some general knowledge of the animals in the community, when the course has been completed. It is often necessary to make comparisons with other animals in order to arrive at definite conclusions. An an example, by comparing cost of production, other things being equal, of sheep and hogs, one may decide which is the more profitable to raise. Good teaching demands that the pupils get some fundamentals of animal life, the possibilities of their success by studying the expected cost of production and market conditions before starting their business enterprises.

The kind and type of animal, that the boy selects for his project, will depend upon his previous experience, his liking for particular kinds of animals, the amount of stock and equipment available. He should first get the consent of his parents for a project large enough to be worth while and not too large to utilize all his time. The opportunities under local conditions and the demand of the market for the particular animal or its product, that he desires to raise, should also be limiting factors.

The boy will first need to find out the requirements of his stock for the purpose for which he is going to keep them. He will soon learn that different kinds of animals require different kinds of feed. This leads to a study of the com-

position of the body, the waste and marketable products, as well as the amount of energy required for digestion and maintenance. This leads to the application of the sciences connected with the laws concerning the values of various feeds. The pupil, for example, will learn about the digestive system and assimilating processes which change alfalfa into milk, or barley into meat and eggs. This brings up the whole question of digestion and assimilation. The digestive system of the project animals is compared with that of other animals in the community, as to which individual and which types of animals are the most economical consumers of feed. This leads to the type and kind of animal to select for the project work. It will be found that one individual might require more feed than another to produce the same results. This leads to a careful study of characteristics which should be pointed out at this time, calling upon every field of science to explain why one animal is a more economical consumer of feed than another. The problem of feed leads to problems, as economically constructed types of buildings for housing the pupil's project animals, as barns, poultry and hog houses. These problems easily suggest the study of the best and most economical feed to raise from the standpoint of digestive nutrients, as well as from the standpoint of local climatic conditions. Some feeds will need to be kept in an air-tight condition which will suggest the use of the silo.

The pupil has learned in the study of plants that they behave differently under different conditions. This is also true of animals. His project animals will respond to proper care and treatment. This leads to the study of why some animals do not develop equally as well. It may be due to some insect or pest which can be controlled or it may be due to some disease or accident which may bring in the

application of the medical sciences connected with animal industry. The observation of the results of the application of some science that might improve the condition of the animals, or save their lives in an epidemic like cholera or the foot and mouth disease, will be beneficial to the pupils. This may be of future use to the pupils in saving them from some unhappy experience due to the lack of the application of some science to their particular project.

The pupils will see the need of better stock which will bring them into the field of selection, breeding, and improvement. They will see that their animals are subject to certain laws which must be obeyed in building up the herd, drove, or flock as the case may be.

The work leads into the application of practically every phase of the animal industry, in such a way as to connect it with every day activities of the pupil. He will learn many lessons from the business world, of successes as well as failures, often in finding a sale for his products. He will need to make a careful study of market conditions in order to have an outlet for his products. In this way he will be laying a foundation for the beginning of the animal industry for his work, if he should choose it for his profession. The whole field of the animal industry will be visualized and he will have developed initiative for his future occupation or profession.

This course, if properly presented, will influence the pupils' likes or dislikes for raising animals. Many misfits in later life will be eliminated by giving the pupils first hand knowledge of plants and animals for a broad choice in life. This course lends itself to the same methods of teaching as that of the first year. The time for class, laboratory, and individual instruction should be the same as in the previous year. The following outline is merely suggestive, depending upon the project selected.

POULTRY HUSBANDRY (CHICKENS)

I. Introduction.
   A. Importance in the United States, state, and community.
   B. Compare with other products.
   C. Growth of the industry.
   D. Requirements for success, as good breeding, feeding, and sanitation.
   E. Outlook of the poultry industry.

II. Improvement of Fowls.
   A. Advantages of a pure breed.
   B. Selection for constitution and vigor.
   C. Value of good cockerels.
   D. Advantages of good breeding.

III. Types and Breeds.
   A. Egg, dual purpose, and meat types.
   B. Egg, dual purpose, and meat breeds.
   C. Conditions under which each would be most profitable.

IV. House and Yards.
   A. Location of house and yards.
   B. Types and kinds of house plans.
   C. Construction of house and equipment.
   D. Construction of yards.

V. Incubation and Brooding.
   A. Natural versus artificial incubation.
   B. Essentials of a good incubator; kinds.
   C. Precautions in operating an incubator (selecting eggs).
   D. Special care at hatching time.
   E. Essentials of a good brooder; kinds.
   F. Care and operation of brooder.

VI. Feeding.
   A. The digestive system.
   B. Balancing the ration (kinds of feed).

C. Feed for growing chicks.
D. Feed for egg production.
E. Feed for fattening.

VII. Care and Management.
A. Care and management of young chicks.
B. " " " " growing stock.
C. " " " " mature stock.
D. Pests of the poultry flock.
1. Diseases, external and internal.
2. Causes, appearance, control of such as roup, scaly legs, indigestion, cholera, chickenpox, diarrhœa, tuberculosis.
3. Prevention and treatment.
4. Sanitation and disinfectants.
5. Other pests, appearance, and control.

VIII. Marketing.
A. Fattening for market.
B. Preparation for market.
C. Marketing eggs.
D. Storing eggs.
E. Coöperation in shipping poultry and poultry products.
F. Outlook of coöperation for the poultry industry.

IX. If project is in other poultry it can be studied from the above outline.
References.
Poultry Keeping by H. R. Lewis.
Domestic Birds by J. H. Robinson.
Poultry Culture by B. F. Kaupp.
Standard of Perfection.
Poultry Laboratory Guide by H. R. Lewis.

CHAPTER X

THIRD YEAR AGRICULTURE

After the pupil has had a year in the study of plant life and a year in the study of animal industry, he will want to go deeper with some special problems, as in fruit industry, dairying, hogs, beef cattle, farm crops, vegetables, or poultry on a larger commercial scale. The pupil's special interest in which he will continue his project should be chosen as the basis for the third year's work. Pomology seems to offer a great field in communities specializing in that line. Not a few are selecting dairying, if in a section where that is the major industry. The boy may want to continue his project of the previous year. This will necessitate his going deeper into the subject, which is very desirable. The type of farming in the community is a large factor in determining the third year's project, which will be the basis for the course.

The third year's course, like the preceding ones, should be based on a seasonal sequence of the project. If it is pomology, as an example, an outline should be followed for the development of the fruit industry and every phase that enters into the logical development of the project should be studied at the time that it will make the work better understood. This course is given more to details and the technical phases in which the boy is interested, than the preceding general courses, since one special line of industry is selected as the basis for the course. The work should be thorough and complete records kept as the course develops.

Every angle of the industry should be considered in its relation to other industries in the community.

The same amount of time should be given to this course as to the preceding ones. The method of presenting the work will differ only in that more time will be given to special phases of the industry which are most important. Problems will suggest themselves, reaching into other fields that will need to be considered, in order to properly visualize the industry in its relation to other industries in the community. It is not improbable that problems will arise, which will require some investigation work by the pupil in considering the problems in their larger perspective. The teacher should carefully plan all trips that will be necessary for the pupils to take so that the course will be made most worth while.

OUTLINE FOR THIRD YEAR AGRICULTURE

DAIRY HUSBANDRY

I. Introduction.
   - A. Importance of the dairy industry.
   - B. Dairying as related to diversified farming.
   - C. Dairying as a special industry.
   - D. The demand for dairy products.
   - E. The dairy type, conformation and temperament.
     1. Origin of dairy type.

II. Study of the Breed.
   - A. Outline of each important breed in the community. Origin and history; characteristics, size, conformation, temperament, breed points, points of excellence, defects; good individuals, noted for butter fat, milk and cheese; breeders' organizations; adaptability, to what extent adapted to local conditions.
   - B. Herd improvement; methods of breeding up the

herd; selection of good individuals and good sires; part that breeding plays in selection; advantages of keeping records; value of advanced registry for records; value of coöperation in breeding up dairy herds in the community; cow testing associations.

III. The Digestive System.

The digestive system should be considered in detail unless it has been studied in connection with the work in previous years.

IV. Care and Management.

A. Feeding:—maintenance, growth and milk production; Feeds:—concentrates, roughage and succulents, balanced ration, economy, nutrients and palatability, feeding standards for milk production, (value of silo), feeding cows in milk, when dry, feeding sire, young, summer pasture and soiling crops; water, fresh and at all times; salt, amount, when given, value.

B. Care of the dairy animal. Dehorning, methods and value; care during time of calving; milking machines versus hand milking; care of calves, sire, and dry cows; barn, size, convenience, light, ventilation, disposition of manure, dairy law requirements; value of regularity in care of cow; use of Babcock Test in detecting boarders.

C. Common diseases. Causes, symptoms, treatment, prevention of such as tuberculosis, abortion, milk fever, foot and mouth disease, lumpy jaw, scouring in calves.

V. Milk and Milk Products.

A. Milk room, location, construction and equipment.

B. Milk production; process of secretion and composition of milk. Cleaning cow before milking;

proper handling of milk; milking utensils, kind and their care.

C. Milk products. Use of separator, Babcock Test, cause for variation in cream test; care and handling milk; ripening cream, making butter, essentials as figuring overrun, determining moisture content, amount of salt to use; essentials of cheese making; condensed and evaporated milk; essentials in making ice cream.

VI. Dairy Laws.
- A. Sanitation.
- B. Commercial milk.
- C. Diseases and disinfectants.

VII. Marketing.
- A. Necessity of a steady market.
- B. Forms of selling milk; whole milk; butter fat and butter.
- C. Grades of milk; certified, guaranteed; grade A; Grade B, etc.
- D. Methods, wholesale and retail.
- E. Conditions which determine profits in each case. Nearness to market, cost of feeds and price of land or its rental value, cost of labor, use of surplus milk for hogs, calves, and chickens, demand of the market.
- F. Marketing through coöperative creameries and cheese factories.
- G. Time and method to sell surplus stock.

VIII. The Future of the Industry.
- A. The increased demand for milk and milk products.
- B. The coöperation to standardize products.
- C. Educating the public to the food value of milk and milk products.
- D. Kind of dairy stock used and location of dairies.
- E. Value of state sanitary laws.

FRUIT INDUSTRY

I. Introduction.
  A. Importance of the fruit industry in the United States, state, and community.
  B. Fruit regions of the United States.
  C. Kinds of fruit grown in different parts of the state.
  D. Outlook of the fruit industry.

II. Determining Factors.
  A. Temperature, moisture, climate, and soil.
  B. Pests and diseases.

III. Factors Influencing Location.
  A. Distance from market.
  B. Character of soil and subsoil.
  C. Kind and amount of labor available.

IV. The Apple.
  A. Introduction.
    1. Best varieties to plant.
    2. Varieties best adapted to community.
  B. Factors in locating the orchard.
    1. Temperature, altitude, and exposure.
    2. Soil and subsoil.
  C. Preparation of land before planting.
    1. Method of cultivation.
    2. Time and depth of plowing.
  D. Laying out the orchard.
    1. Methods.
    2. Plans.
    3. Use of fillers.
      a. Advantages and disadvantages.
      b. Varieties to plant.
  E. The young tree.
    1. Propagating in the nursery.
    2. Age and variety to plant.
  F. Preparation for planting.
    1. Distance apart.
    2. Staking off the ground.

3. Digging holes.
4. Preparation of trees for planting (labeling and pruning).

G. Planting the orchard.
1. Depth.
2. Method.

H. Cultivation.
1. Time and depth to cultivate.
2. Mulch versus cover crop.

I. Irrigation.
1. System of irrigation.
2. Amount of water to use.
3. Frequency of application.
4. Necessity for immediate cultivation.

J. Pruning.
1. Time and method of pruning young trees.
2. Principles involved; as cutting above a bud or limb.
3. Advantages of the open center.
4. Pruning old trees.
5. Tools for pruning.

K. Enemies.
1. Chewing and biting insects.
a. Life history of important ones.
b. Sprays to use and the methods of control.
2. Diseases.
a. Life history of important ones.
b. Methods of control.
(1). Time to spray and material to use.
c. Combined spray for insects and diseases.
d. Spray machinery.

L. Protection from frost and freezes.
1. Smudges; orchard heating.

M. Apple products.
1. Kinds and value of.

N. Harvesting and marketing.
1. Picking the fruit depends upon the kind

of fruit, where it is marketed and for what used.

2. Utensils used.
    a. Necessity for hand picking.
    b. Kind of ladders.
    c. Containers used in picking.
3. Grading and packing.
    a. Necessity for grading.
    b. Essentials of a good pack.
        (1). Must be attractive, ship well, and should be uniform in size and sound as a result of careful handling.
    c. The kind of equipment used in packing.
    d. Methods of packing.
    e. Storehouse for fruit; essentials of.
4. Marketing.
    a. Pre-cooling refrigerator cars.
    b. Commission men.
    c. Coöperative associations.
        (1). For storing and shipping fruit.
        (2.) Buying materials.

CHAPTER XI

FOURTH YEAR AGRICULTURE

The fourth year course in agriculture should be one which demonstrates managerial ability. It may be after the pupil has made a study of the various fields of agriculture, that he will want to better understand the principles upon which the farm is managed. This will necessitate a detailed study of the managing problems of the entire farm.

The methods of keeping accounts of each branch of business on the farm should be studied in detail. The best system of book-keeping and the methods of keeping accurate and up to date records should be studied as well as the management problems in determining the rotation of crops, the most economical use of tractors, or horses, as well as a more even distribution of labor during the entire year. This will include checking up on the various crops and live stock to show which are paying and which are not. The project selected for this course, unless it be a continuation of the previous work, will be determined by the size of the farm, the type of farming, and the conditions under which the products are marketed.

Such economic factors as the best type of farming suited to the community should be considered. After all the phases have been studied, such as topography, soil conditions, climate, and the distance to market, the pupil will have a better understanding of the future outlook for the products selected.

It should be kept in mind that the two greatest problems

A PROJECT HOG. Lodi, California

A GRAPE PROJECT. Lodi, California

MIXING CONCRETE. Kingsbury, California

STUDYING THE PLOW. Kingsbury, California

to be considered in American agriculture are: first, the necessity of land ownership for contented labor; second, better trained citizens, to adjust the rural, social and economic problems which will enter in when adjusting the present prices of labor to the prices of farm products. Then more emphasis will be placed upon the value of standardization, grading, methods of selling and other market problems.

The four years' course which should be a spiral of additions each year, will furnish a detail analysis of the farming business. The project should not only include a record of all the business transactions including a final summary of the year's business, but it should indicate suggested changes in methods of farming. It should include a reorganized plan of crop rotation, of the kind and number of animals to be kept, of additional equipment needed, conveniences for the farm home, and the expected financial returns under the reorganized plan.

The time and method of presenting this year's work should be the same as in the preceding ones. When the pupil has finished the course in farm management, he should have made a thorough study of every branch connected with the farming enterprise.

The following outline should serve as a basis for the fourth year's work:

COURSE IN FARM MANAGEMENT

I. Introduction.
  A. Development of present day agriculture.
    1. Evolution of farm machinery.
    2. Improvement in; methods of farming, farm equipment, soil fertility, farm crops, and live stock.
  B. Field of management.
    1. Meaning of subject; its scope and field.
    2. Relation to farm crops, animal hus-

bandry, rural economics, rural organization, and farm life.

3. Relation to other industries; coöperation and organization.

C. Terms used in farm management: Capital, inventory, receipts, expenses, farm income, labor income.

D. Farm Book-keeping and Farm Records.

II. Farming as a Business.

A. Qualifications of a farmer.

B. Capital classified.

C. Investment; in farm, buildings, equipment, live stock.

D. Running expenses, personal and farm.

E. Profit to be expected.

III. Kinds of Farming.

A. Vegetable gardening; fruit growing; crop growing; live stock farming; mixed stock and crop farming; other kinds.

IV. Factors Influencing Farming; Land, Labor and Capital.

A. In relation to external conditions; soil fertility, climate and topography, land values, capital and labor, insects and diseases, individual preferences.

B. In relation to profit to be expected, maintenance of soil fertility.

C. Land.

1. Value depends on location, nearness to market, existing economic conditions, soil fertility and nature, irrigation, drainage, and waste land.

2. Land tenure; ownership, leasing, renting, share-renting. (Advantages and disadvantages).

D. Capital; fixed, circulating, in relation to undertaking, methods of obtaining capital, term or payment and interest rates.

E. Labor.
   1. Man labor; cost per day, month, year; compared with machine labor.
   2. Horse labor; its place and cost.
   3. Power; oil, gasoline, water, wind, electricity, place on farm.
   4. Management of labor; superintendent or foreman, employer, employee, living and housing conditions, (sanitation), social conditions and education, methods of securing labor and amount profitable.

V. Choosing a Farm.
   A. As a business.
   B. As a home.
   C. Healthfulness.
   D. Schools.
   E. Churches.
   F. Neighbors.
   G. Markets.
   H. Size of farm; expected returns.
   I. Producing capacity; soil.
   J. Climate.
   K. Improvements.

VI. Planning a Farm.
   A. Need of planning.
   B. Farmstead; organization, location, size, location of dwelling house and other buildings; remodeling an old farmstead, grouping of buildings to save labor; building plans.
   C. Size, number, shape of fields, relation to farmstead, accessibility.
   D. Rotation system.
   E. Relation to proper records.

VII. Equipment of Farm.
   A. Buildings; number, cost based on farm needs, made to increase income.

B. Machinery and tools; what machinery and tools needed, time to buy, size of machinery, management and maintenance, depreciation.
C. Live stock; determining kind and number, productive value, management, relation to soil fertility.

VIII. Managing the Farm.
A. Factors of management.
1. Farm crops, farm animals, farm equipment.
2. Best use of time, land, labor, money and knowledge for; profit, permanent agriculture, and country life.
3. Advantages of rotation of crops.
4. Advantages of permanent labor.
5. Farm books and accounting; methods of accounting; simple book-keeping, single and double entry. What books to keep, farm records, how to keep farm books, records and accounts.
6. Sources of information. Emphasis should be placed upon farm book-keeping.

IX. Marketing.
A. Importance of proper and timely marketing.
B. Principles of marketing.
C. The market supply and demand.
D. Preparation for market.
E. Time to sell.
F. Methods of marketing; local store, commission men and houses, direct shipment, auction sales, coöperative organizations, basis of organization, advantages, and limits.

X. Farm Life.
A. Farm home; size, arrangement, conveniences, up-to-date equipment.
B. Schools.

C. Churches.
D. Community centers.
E. Social organization.
F. Coöperative enterprises.
G. Program of development for particular community.

XI. References.
A. Books.
1. *Farm Management*—Boss.
2. *Introduction to Rural Sociology*—Vogt.
3. *How to Keep Farm Accounts*—Steiner.
4. *Rural Life*—Galpin.
B. Bulletins.
1. Year books, U. S. Dept. of Agriculture, 1915 to 1920, inclusive.

CHAPTER XII

THE FARM MECHANICS COURSE

One of the vital problems in connection with the field of agriculture is for the farmer to be able to care for and repair his farm machinery, farm buildings, and other farm equipment.

While the farm mechanics' work in most cases should be taught as a separate subject, it should be connected very closely and in many cases be a part of the home project work. It should include farm drawing, farm carpentry, farm forging, cement and concrete work, tinning, plumbing, soldering, pipe fitting, electrical wiring, and farm machinery including gas engines, tractors, and automobiles. No set outline can be followed in this course as every individual project presents its own problems in farm mechanics. Many of the home projects will involve the construction of a building, laying concrete, electrical wiring, pipe fitting, tinning, and care and repair of most all kinds of machinery. In this way almost all the principles of farm mechanics will be brought out as the project progresses.

Good teaching demands that the pupil be prepared when he comes to do actual work or that he be given instruction at the time needed in order to do the job instead of hiring part of his project work done.

One of the first courses after mechanical drawing should be farm carpentry. This course should begin with an explanation of each tool to be used. Demonstrations should be given at the beginning of the course in order to show

the proper method of handling, sharpening, and use of the tools used as well as the care and necessity of keeping them in their proper places. All tools should be standard size and standard makes. Joints for joints' sake have no place in vocational agricultural courses.

The instructor should see that the pupils observe the following steps throughout the course:

1. Have a definite purpose in view before starting each job.
2. Submit a plan drawn to a scale of each article to be made before attempting to construct it.
3. Submit a complete bill of material including the cost of same before starting the work.
4. The instructor should accept no piece of work that is not well done.

In arranging the course, it should be so planned that each pupil will get experience in the fundamental operations, such as: boring, chiseling, cross grain and rip sawing, filing saws, glazing, nail setting and pulling, planing, screw driving, mitering, tapering, painting, and sharpening by use of oil and stone.

Some suggested articles that may be made in connection with farm carpentry work are: bee hives, brooders for chickens, farm tool boxes, feed bins, feed troughs for hogs and poultry, hay racks, hog hurdles, irrigation weirs and gates, ladders, milking stools, nail boxes, packing sheds, planting boards, sack holders, saw horses, self feeders for hogs and poultry, sheep and hog shipping crates, wheel-barrows, and work benches.

In the study of concrete, permanency and initial cost should be compared with that of other materials. Emphasis should be placed upon proportion of materials and the necessity for thorough mixturing. This course should be so planned that each pupil will get as much experience as

possible in making some of the following: walks, posts, floors, water and septic tanks, drain tiles, dipping vats, hog wallows, silos, and building foundations.

When taking up the farm forging work, the instructor should begin by explaining the names and uses of the various tools to be used in the course. Explanation should be given in the care of the tools as well as the methods of keeping them in their proper places in the farm shop. It is desirable that the pupils be shown how to handle the various tools and how to use the fire before beginning actual work. No pupil should be permitted to do careless work or to waste materials. Habits of accuracy are to be formed as well as of utilizing all available material so far as possible. The course should be so planned that the pupils will have experience in the following operations: welding chain links or bolts, making gate hooks, corner welds, sharpening plow shares, making gate hinges, making cold chisels of octagon steel, making staple pullers, and sharpening hand tools.

The course should be thorough enough so that the pupil will have developed the confidence and ability to do forge work when the occasion demands.

At the present rate of inventions and improvements, it is necessary to have a course in farm machinery. This course should begin with the kind and type of machinery used in scientific farming. The evolution of machinery for a specific purpose as for harvesting wheat and how modern machinery has influenced the farming industry should be studied. Some time should be given to a study of the best machinery to use on the average farm. The equipment used in this course can largely be borrowed from an up-to-date farmer, because it is too expensive for the average high school to buy all the equipment that is needed for this course, as the equipment is used but a few times during the year.

The class should do as much repair work as possible on

such machinery as: plows, discs, harrows, cultivators, and the various kinds of harvesting machinery used in the community. It is desirable for the pupils to assemble machinery, take a part and re-adjust, in order to become familiar with the operation. In assembling, the name of each part and its use should be learned as the work progresses.

Emphasis should be placed upon the present tendency of greater production per man unit, which means the use of the very best and latest equipped machinery. The teaching methods in this course should be similar to those of the previous courses, in that demonstrations should be given at the beginning in order to familiarize the pupils with the best methods of attacking the laboratory work.

In the automobile and gas engine courses actual repair work should be done. Assembling and adjusting motors is good practice. All parts taken from the machine should be carefully marked and placed in boxes, so as to eliminate any chance of parts becoming lost. Have a place for every tool and see that every tool is found in its place before the class leaves the room. Neatness and order increase efficiency in eliminating time in hunting for tools.

In the study of electricity the principles involved in the electrical current should be carefully considered. Some practical wiring should be done. Since electricity is becoming more and more important on the farm, the pupils should understand how to wire a building, the care and repair, and operation of electrical equipment. The methods in teaching this course will not differ from that of the other farm mechanics courses. With the number of inventions and improvements being made in electrical equipment, it will be found worth while to spend much time on this subject.

In most cases the work in farm mechanics courses should start as group instruction until the class is familiar with the proper method of handling the tools and of keeping them

in their proper places. The instructor should have a definite schedule for each practice period and see that but little time is wasted in assigning each pupil his definite task. Reference material should be well in hand before beginning the lesson and the pupils' specific questions that they wish to ask should be answered before beginning the laboratory work. Unless a plan is followed, much confusion and loss of time will be the result. The instructor should emphasize in the beginning that it pays to sharpen tools when they need it. Instruction is more difficult after the course is started for as soon as the fundamental principles have been developed the work will be mostly individual instruction. It not infrequently happens that some of the articles will be made at home and in this way the instructor will need to give individual help to the pupils at their home.

The present trend of farm mechanics is taking one of two definite directions. One is to teach such courses as farm carpentry or gas engines for a semester or an entire year; the other is by short unit courses in the main subjects until the pupils have familiarized themselves with the principles underlying the courses and then follow the mechanics of the project work, applying the principles whenever needed. As an example of the latter, in constructing a poultry house they would do drawing, carpentry work, concrete work, forging, pipe fitting, and electrical wiring. It is for this reason that the teacher should be familiar with every branch of farm mechanics. Mistakes in this course are often expensive and this is why farm mechanics is coming to be a required course.

In many cases this work requires a teacher with a cooperative mind for much of the material may need to be borrowed from other departments. In many states a separate course is given in mechanical drawing, wood working, cement, farm forging, gas engines, automobiles, and farm

machinery by teachers in other departments. In schools where this method is followed, the farm mechanics that is given by the teacher of agriculture will be only in connection with the home project.

When farm mechanics is given as a separate course it is preferable that two consecutive laboratory periods be given to the work for best results. The method of presenting it offers a different field in that there is more individual instruction. Care should be taken to see that each pupil gets the fundamental principles in farm mechanics in his high school course, and is able to do the ordinary care and repair work of the machinery used in connection with his farm activities.

CHAPTER XIII

COÖPERATIVE RURAL ORGANIZATIONS

Since the beginning of agricultural activities in the United States, organizations by many different names have sprung into existence. Those that have best fulfilled their mission have survived, while many have been short lived. The early idea was to have large organizations, while now we believe in small groups as part of the general organization working for the needs at hand. The purpose of rural organization is to pave the way for greater progress in community industries and activities. By means of organization greater coöperation can bring about a more useful, a more prosperous, and a more contented community. There is danger of a community having so many organizations that some will not properly function. It is better to have a few and have them working to their full capacity.

One of the oldest farmers' organizations, which still survives in many places is the Grange, organized in New York in 1868. It had a most phenomenal growth for a few years and was the forerunner of many organizations which have since sprung into existence. The Grange had for its purpose in the beginning the social improvement of its members, but soon went into coöperative buying in wholesale quantities and distributed to its members in the community. Thousands sought financial betterment under the order while others sought political ambitions so that many of the granges organized about this time failed. It began to revolutionize the life of the communities, but it has had its

struggles. The Grange is still the leading organization in many places.

The Farmers' Institute had its beginning in the Philadelphia Society for the Promotion of Agriculture in 1785. It was called "Farmers' Clubs" in Maine in 1843. As early as 1903 the Farmers' Institute was recognized by the national government by the appointment of a farm institute specialist in the Department of Agriculture. He gave his entire time to organizing and rounding up institutes and in giving special assistance to its members.

Community Center Meetings were organized in some places while the Grange was still connected with political parties. Its meetings were held at a central point in the community for the purpose of discussing actual problems along the lines of special crops, animals, or other community interests and activities. These meetings were often of a social nature.

The Farmers' Coöperative Demonstration Work, which was started by Seaman A. Knapp, of the United States Department of Agriculture, did not progress very rapidly through mature men, so he tried having boys raise an acre of cotton or corn for demonstrational purposes. This extended to the school children and in 1908 it was started under the name of "Boys' and Girls' Agricultural Clubs." The Girls' Demonstration Club was started in 1910. In two years the boys had an enrollment of 69,000 and the girls 23,000. The work consists of demonstrations to show what can be done in the community under scientific management. The Boys' and Girls' Agricultural Clubs are conducted on a competitive basis and various prizes have been offered as a reward for efficient work. These agricultural clubs have done much toward laying the foundation for vocational agriculture.

The Farm Bureau Center is an organization of farmers

who have combined to investigate their fundamental problems and to promote the agricultural interests through coöperative study of farm conditions. This organization is the amalgamation of other associations in many places. While the working plan differs in many states, the principles are the same. The organization consists of local farm bureaus which meet at least once a month. One local representative meets with the county farm bureau once a month and the county representative meets once a year with the state organization. A state representative meets yearly with representatives of other states. The county organization often has to meet with them a Farm Advisor, who is a representative of the state and Federal Government, and who is the county agent or farm demonstrator as he is sometimes called. He gives advice or gets information for the farmers, aids in coöperative organizations, investigations, and demonstrations. There are 501 farm bureau centers in California alone. The farm bureau is interested not only in all agricultural questions, but in social, economical, and educational problems as well. This organization known by its various names in the different states, is filling a real need in bettering rural life.

The District Fair is another organization which meets yearly in many sections. Samples of the crops are displayed at the fair and ribbons awarded for the best. Not infrequently farm experts from the College of Agriculture or others are there to discuss various lines of agricultural interests in that section. This has also had an educational value and is combined with the schools in order that they too may have an opportunity to exhibit their products. The best products from the district fair will be exhibited at the county fair, which is the stepping stone to the State Fair.

Where rural organizations are well conducted they are

THE ROAD WHEN THE COUNTY FARM ADVISER FIRST CAME
In Tennessee

THE SAME ROAD AFTER A YEAR OF COÖPERATION

A COMMUNITY PLAY

AN ATTRACTIVE HOME

a great asset to the community in increasing production, in providing better protection from diseases and insect pests, and the community has a better system of marketing its products. We find many organizations, such as grain growers', dairying, live stock, and fruit growers' associations in various parts of the United States. Some organizations are specialized as the honey producers, butter makers, grain, cotton, and citrus fruit growers. By means of organization their products have been standardized. The producers in this way can do collective bargaining in both selling and buying. They often do their own experimental work. The most effective organizations are those that deal with small groups as a branch of a larger organization, such as the Apple Growers of Oregon or the Prune Growers' Association of California.

By enlarging the individual's usefulness the entire community is made more efficient. As an example, in fighting an insect pest of fruit, it would be useless for just one farmer in the community to spray unless his neighbors did likewise. But by coöperation with his neighbors, the entire community may be rid of the insect pest.

The school is likewise a coöperative enterprise in educational affairs. By consolidation of rural schools, better buildings may be erected, better teachers secured, better equipment installed, and more efficient work will be done in developing the child. The school will also be the place for lectures, school festivals, farmers' short courses, and for gatherings which promote education in the community. Leaders will be developed to direct community activities, which will influence the making of more useful citizens as well as better farmers.

The rural church is another great factor that has done much to elevate the moral and intellectual development in rural communities. It has been the experience that where

there are several churches the interests in the community will often be divided into groups or cliques, which is detrimental to progress. In a community where the people are becoming broad-minded and united, there is need of a real rural church with a progressive leader. Where people associate together and discuss the better needs of life, the community is sure to establish a higher standard of living and higher ideals, which will go to make for scientific agriculture on a broader and more progressive scale. The lesson of coöperation is also brought out in the social activities connected with the rural church development.

The teacher's place in community gatherings should be that of usefulness. When there is an opportunity to work through one or more of these organizations to further his agricultural work, it should not be overlooked. Usually the strongest men in the community are the ones to take a great or the greatest part in some of the better organizations. The teacher should not assume the responsibility of managing, but should be a help wherever possible. He should stand behind the people of the community in the organizations for the betterment of all types of agricultural work. It is often much better for him to raise a few animals or grow some fruit, or whatever the coöperative organization is marketing. Thus he will be in closer touch with the leaders of the organization and will be in a better position to furnish the information which the school children should receive. In this way he may be of service to the community in which he is working.

One of the best lessons in rural coöperative organization[1] to be found in any country before the recent war was that of Denmark. After the German War of 1864, it, like other European countries, was in dire distress in political, social,

[1] Faber's *Coöperative Organizations in Denmark.*

and economical conditions. Not only has the land been a basic factor in the upbuilding of Denmark but the remarkable school system has had an unwielding influence. The war crippled and almost bankrupted this little country but within two generations it has taken an honorable place among the producing nations of Europe. Its agriculture is unexcelled in production from the soil, and in distribution of the manufactured products in the markets of the world. Denmark has less than 15,000 square miles or is about one-third the size of Pennsylvania, with a population of about 3,000,000.

Since 61 per cent of its people live in the country, it indicates that a large degree of prosperity and contentment is found in the rural districts. The Danish farmer has solved the market problem and is able to place his products upon the world's markets to good advantages. There are over 1,400 coöperative stores in Denmark. In addition to these, many scores of societies are formed for the joint purchase of feed stuff, fertilizer, farm implements, and necessary clothing. The coöperative dairies and cheese factories have given the Danish farm industry a wide name. One dairy alone receives the milk from 1,200 cows. In 1915 about 2,000,000 hogs were slaughtered in the coöperative bacon factory. Government breeding centers have been a great help to the live stock industry.

Large land holders and the day of land-lordism are things of the past in Denmark. Low rates of interest and long time payments on the amortization plan have solved the land question. The rural credit system has made it possible for 75,000 families to become land owners and any person twenty-five years of age, who can satisfy the government as to his character, may secure a piece of land and pay for it at from three to three and a half per cent inter-

est. The Danish motto is "Use all the land and abuse none." It was found that only two per cent of the large coöperative association members live in cities. When the great coöperative dairies were formed, the farmers pledged themselves to furnish a given amount of milk for a specified number of years. In the same way the Danish people promised to furnish a definite number of hogs for a specified number of years.

Egg production is the third most important industry. The poultrymen themselves handle only fresh candled eggs. Their reputation is unquestionable. The peasantry land ownership has made wonderful changes, bringing the country from a condition of national bankruptcy to her present place.

The schools furnish broad culture and thorough technical preparation to every man, woman, and child living in its rural districts. The spirit of coöperative enterprise is instilled into the school youth and put into practice when he becomes a man. It was in the disastrous war period of 1864 that the first folk high school had its beginning. These schools have disseminated among country folk a broad general culture in order to see the world in its large perspective. The schools have helped these people to think and to reason for themselves. The coöperative work has taught them to trust one another in working together for the common good. Their entire organization has been accomplished by the intelligent farmers after they have had thorough training. Their keynote has been extreme thoroughness in their preparatory work. The Danish farmer not only knows what he is doing but why he is doing it.

The elementary schools of Denmark emphasize the fundamental school subjects in a thorough-going fashion and at the same time the study of the soil and its products have

not been neglected. Even the elementary schools begin with part time class room instruction and part time practice outside work. After leaving the elementary school, physical education in the form of practical work is kept in the foreground for the next four years. The boys usually work on model farms until they reach the age of eighteen when they attend high school. The Danish country boy leaves the elementary school at the age of fourteen to work on these farms. From eighteen to twenty is the period spent in the high school where emphasis is placed on the cultural side before he finishes his agricultural work.

The aim of these high schools is to develop broad-minded, moral citizens; to foster a deep-seated love for the soil of their own native land; to give them a correct outlook on agricultural life; and to lay a broad foundation for technical subjects to be pursued in agricultural schools. The boys usually attend the school in winter and the girls in summer. Free instruction often ceases after the elementary schools, which are compulsory. Natural science is given special attention in their agricultural schools. The curriculum is not so different from that of our junior college except that some emphasis is put on the practical side. After these schools come the special schools, such as the dairy school. Here is where the special work is done. The students and faculty eat their meals together and associate with each other during play hours. The school is in session six days per week. Practically all technical schools have a large farm where they give special training in the particular line that some would want to follow. The amount of time spent in these schools depends upon the degree of efficiency desired and the mental capacity of the student for that power. The result of this type of school training has led to cooperation and has caused first, the yield per acre to be in-

creased; second, the country has been improved; third, the cost of production has been decreased; fourth, better prices have been obtained.

The greatest result of high school training has been that it puts the mind in a condition to render capable service and to receive and profit by expert specialists. This is in contrast with the greater part of the American farmers, who loathe to listen to expert advice regarding new adjustments. The people of Denmark are trained in reading habits, to have open minds, and to respect expert advice. It is for this reason that the coöperative societies have the common good socially as well as commercially. The schools insist upon adaptation of both mind and health. They believe that broad culture provides better equipment for the young farmer. There is no lecturing in their school system, on account of the strong personality of the high school teachers. One secret of their schools is that they have well trained teachers, who are employed for a long tenure in the same community. The teacher is considered a real leader; he has a school farm of several acres, a home, and a good salary. They believe that the teachers should not have a vocational school, but a school of general culture, introducing vocational culture as the opportunity is offered.

The success of the Danish rural people is due to: first, land tenure; second, rigid enforcement of preparation in special phases of agricultural work; third, a highly specialized school system. The American people may learn from the Danish school system the lesson of thoroughness as well as preparation for better citizenship. The Danish youths are taught the subjects and the whys underlying scientific farming instead of cramming their memories with languages and higher mathematics as has been done in our

American schools. The boys there would resent the dead languages in the words of Wilson, our National Grange Master, when he said:

> All those are dead who spoke it,
> All those are dead who wrote it,
> All will die who try to learn it,
> Blessed death, they surely earn it.

The schools are thorough in their training in giving the boy the adolescent period in which to learn the practical side of agriculture at home, and then specializing after he has cultural training, so that he is worth much to the rural community of which he is to be a part.

Our industrial movement in vocational work, especially in agriculture, is approaching the lines in which Denmark has been going for the last forty years. We are beginning to learn that the Danish people found out that as the training is so will the man be and that if a rural man is to do scientific work and coöperate to sell his products, and be socially influential in the state, he must be trained for these things during his school life. We must have a better type of teacher, one who has the vision and who is employed for a long tenure of time; one who is willing to put his best into the training of young men and women, if we expect within the next generation to even accomplish the coöperation and to make as useful a citizen as Denmark has made.

CHAPTER XIV

THE TEACHER OF AGRICULTURE

Since one of the greatest handicaps to successful agricultural work in the schools has been the lack of preparation of the teacher, it is well to look into the elements which should go to make up his preparation. Efficiency in any line of work means producing the maximum results with the least amount of time, energy, and money. Scientific management in school would then mean the most economical adjustment of all forces toward a definite end. The teacher's greatest efficiency is in doing the highest grade of work for which his natural ability has best fitted him. The characteristic forces influencing life are the intellectual, social, æsthetic, moral, and religious. Without the development of all these characteristics, the teacher would not become a thoroughly education man. The goal in education, then, is to produce the least amount of waste in securing a liberal education. This should be the foundation for study in any occupation or profession, in order that one may get the class of work that he can do the best, so as to bring him the greatest prosperity and happiness in living a more valuable and useful life.

The agricultural teacher's education is one continuous process from the cradle through life. At first the child's mind is a blank with certain inborn tendencies. His first impressions are made by observing differences, probably between his nurse and his mother. He begins to think as soon as he loses his tin rattler because there is need for thinking.

He is forming his apperceptive basis as soon as he begins to have experiences. If left to his own choosing, even with all the surplus energy which soon develops, he would follow the line of least resistance. In this way he would profit by trial and error instead of by the experiences of the human race. Our surroundings have a direct influence upon our development, even at an early age. It is for this reason that the child's environment should be carefully selected. Habits are easily formed and when once established they are hard to change. Impressions are continually being made and influences formed for the child's apperceptive basis to be used as the occasion demands. All forces that come into contact with a child's life have an influence on his educational development. The kind and amount of food that he eats, and magazines and books that he reads, all have a direct influence. The home, the school, the society that he enters, and the occupation that he follows have a direct influence in shaping his life. The moral standard of the home should not be overlooked, as it is under the parents' roof that about one-half the time is spent until the child is nearing the high school age. It is rightly said, "Show me the child's associates made by his own choosing and I will show you the kind of a man he is going to be."

If the school fails to prepare the pupil for the present, the immediate future, and for life in the society of which he is to be a member, it cannot justify its existence. The early training must be broad enough to form the foundation as a basis for the teacher's professional activities. He must have developed breadth of culture, both to enrich his own life and the lives of those with whom he will come in contact. These inborn tendencies begin to show themselves through the different instincts and need to be directed. Some should be suppressed and kept dormant, as pugnacity, while others as play, should be developed. The keynote of

the plant kingdom is the adaptation to its environment. Man does the same thing. He needs food, clothing, and shelter. If he is to become a leader, as the teacher of agriculture is sure to be, his environment will be largely what he makes it. Some of his worthy instincts will be more pronounced in the adolescent period when he will dream dreams and see visions of some successful enterprise of which he is to be the instrument in directing the forces to bring it about. The academic preparation comes in that plastic period of life when rapid mental growth is taking place through new adjustments. Habit forming is rapidly taking place and it is the school's business to develop the power of appreciation of nature and its mysteries. The cultural value should not be overlooked, even though it comes through but three channels, namely, factors of identical elements, principles of habit formation, and giving action to the brain. All teaching is cultural in proportion to the extent that it is in store for usefulness. All instruction is disciplinary to the extent that it renders the pupil efficient to use what he has learned. In the academic preparation, if tables are to be learned, the pupil should learn them thoroughly. He should commit poetry verbatim, if it is to be memorized, and he should get facts definitely fixed in his mind. He should memorize names accurately and speak the English language as fluently as possible. Good habits well established make for progress. For our example, we look to the Roman youth who was trained in obedience, seriousness, and reverence. He was trained like the postage stamp,—to stick until he got there. Much valuable time and hard earned money have been wasted in our system of education, because it was not directed toward a definite end. This waste will be largely eliminated by better trained teachers and by supervised study.

It will be to the prospective teacher's advantage if he has

attended a consolidated school. This school should preferably be in a rural community which will give him a better opportunity for coming in contact with farm life in the open country. He is more likely to develop initiative by association with others of his own age as well as to develop leadership where he has room to play various games. Here his activities will be directed so as to watch the trend of his natural inclinations. He should not attend a special school, not even a special agricultural school, for the range of subjects and the association there will not give him the breadth of culture and will not tend to make him fitted for usefulness other than his chosen occupation or profession. Nature study should be planned so as to start from the most elementary phase, as the daisy or robin and go to the more complex until agriculture has been reached in the seventh or eighth grade. This elementary work should be a well planned course of related material developed step by step to fit the child's life. The illustrations should fit into his life at the time they are being given. This work should be presented in story form in the child's own language.

The lady-bird will no longer be studied for its beauty, but as a destroyer of harmful insects. The large and attractive adults of the Cecropia and Sphinx moths are now to be studied to show that the larvæ of one makes silk and that of the other eats the tomato plant. The elementary school gardens should later become community gardens with individual plots. Experience has proven that this work should be directed by a well prepared teacher for it is designed to have its full educational value and to become a part of the child's experience. The best of the products may be exhibited at the district fair where ribbons are awarded to the most energetic and painstaking youths.

In the high school work enough English should be required so that the pupil will be able to express himself

forcefully in conversation and clearly on paper. Because the farm applications of science are emphasized is not sufficient reason for other subjects being neglected. In the adolescent period the mind is easily receptive and the great masterpieces in literature, if wisely chosen because of their nearness to nature, will aid the pupil in appreciating the bigness of his own surroundings. Each composition should be made a writing lesson, as it is known that fifty-seven per cent of the business men do not write a legible hand. Subjects for composition work should be chosen largely from the pupil's experience and should be something that is practical and related to rural life. Physics, chemistry, and biology should be used in making the practical applications of science to the project and to the pupil's every-day activities. Mathematics should not be required because it develops the mind only, but because of its direct applications in solving the problems useful in his every-day life. In its terms we measure distances and count dollars. Farm accounting is included because society should permit no boy or girl to reach manhood or womanhood before they have learned to keep an accurate account of their business transactions. Music should be taught so that the pupils will appreciate singing in school as well as in other social gatherings. To develop a strong mind in a strong body justifies requiring physical training. Hygiene and sanitation should be studied for personal cleanliness.

History should be studied from an industrial instead of a political standpoint. It should concern itself with the progress of people and industry instead of the rise and fall of kingdoms and dynasties. The study of America's great movements should be made with particular attention to the development of social, economical, and political institutions and their effect upon American progress. Some English and European history should be included in order to form

a background for our social, economical, and agricultural development, as a study of the conditions under which the Shorthorn cattle and the Percheron horses were developed.

Farm mechanics should be practical work, such as making a self-feeder for hogs, brooder for poultry, poultry or hog houses, care and repair of farm machinery, farm implements, and other farm equipment. When the boy can see that his finished products are useful, he is developing the mind and the hands to work together. He will understand the value of skill in making them as well as the value of dollars in hours of labor. When a four year course in agriculture has been completed, the pupil should have a pretty thorough knowledge of all the farming activities in the community. The principles used in this work can be applied at different times in every-day life. By taking a project each year, a boy will study the "bread and butter" aim of vocational education. The course in agriculture in two schools should be similar insofar as the conditions surrounding the two communities are the same. The pupil should not spend all his time in agriculture, for if he should, he would be technically trained instead of being educated.

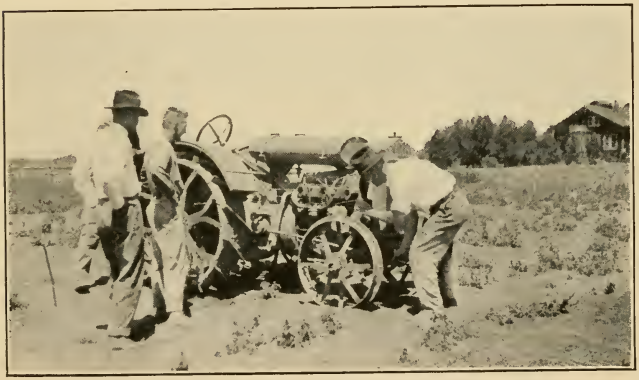
The high school graduate's efficiency will not go far beyond what he is prepared to do. He will, however, have formed habits of politeness, cleanliness, obedience, honesty, helpfulness, industry, and of using his creative power in getting some joy and happiness from life. He will be better fitted for efficient service, regardless of his chosen occupation or profession.

The time will come when all agricultural colleges will require practical work in the major activities of farming enterprises, part of which may be secured by working during the summer vacations. The first two years of the college course should be largely prescribed because many subjects are new and in selecting from them the student is likely to

lose sight of the forest for the trees, and follow the line of least resistance. His professional training is still in the initial stage for the boundary line is seldom drawn twice in the same place. He should have seen the heart of the difference in choosing his calling, in that a trade is followed by the fundamental lines of nature and that the efficient professional man must go behind the rule of thumb. The principles can not be gotten like pouring kerosene into a can, but by continual applications of the artistic and the practical. The student needs not only a knowledge of the fundamental science for a background, but he needs to be versed in the past and present economic conditions so as to take part in preparing for future citizenship. He should be made to see that it is better to have a course in each of the fundamental branches of agriculture for his background. He should have a major for specializing and a minor in one or two subjects. This insures adequate preparation for subject matter and gives him a more cultural background for solving original problems.

One's knowledge needs unification to make him socially efficient. A cone composed of intensive study of at least a few subjects is necessary for this unification. As an example, the student should have mathematics enough to aid in the mechanical solutions in chemistry and physics. He should have work in biology, geology, and physical geography as a background for agriculture. He should have work in education in order to see the fundamental need of a logical presentation of a lesson. He should have a knowledge of the development of the vocational situation in the history of education so as to know the proper relation of the high school to the elementary school and to the university. He should have a knowledge of educational psychology with emphasis placed upon the development of

AN ONION PROJECT. TEACHERS' TRAINING CLASS
Davis, California



TEACHERS' TRAINING CLASS STUDYING THE TRACTOR
Davis, California

BAND OF AGRICULTURAL PUPILS
Lodi, California

SUMMER SCHOOL CLASS AT DAVIS, CALIFORNIA

the adolescent mind. He should know something of the principles of education, of vocational aim, of processes and methods, and of their values with emphasis on teaching agricultural subjects. His work in agricultural economics should acquaint him with the present every-day problems that our country is facing in readjustment. He should have rural sociology in order that he may better understand the principles involved in developing rural life and rural citizenship. By being well grounded in the technical courses in agriculture, he will be able to express himself at any time. Practice teaching should not be measured in number of hours, but in terms of efficiency. This work should be done under normal conditions and supervised by one who is an expert in teaching agriculture. He should also be given practice in supervising home projects. His thesis should be an original problem which will benefit him in his future work. He should have knowledge of psychology to understand the connection between basal and professional subjects. This training will fit him to teach agriculture that will be useful, have the necessary discipline, and be cultural. The teacher should be trained so that he will have an avocation for enjoyment in order that his leisure time will be wisely spent. He must remember that teaching consists of imparting knowledge and not merely the passing out of unrelated facts.

Some personal qualifications are also necessary for success. Being reared in a rural community gives him knowledge for first hand information in nature's kingdom. The teacher should be a born leader and organizer, a close observer, a student of human nature, and possess a strong personality. He should be well poised, not easily excited, a good mixer, kind in disposition, sincere in purpose, industrious, enjoy fun, and be happy on most all occasions.

He should have the ability to adapt himself to his surroundings. His laboratory will then be the picturesque hills and the cultivated fields. His problem in class is one of emphasis and elimination in subject matter in teaching the needs and functions of the plants and animals and how these needs are satisfied. He should cultivate the habit of accuracy, absolute dependableness, clearness in thinking, and of being on time. He must have a coöperative spirit, must be firm but honest, fair to each child, and be prejudiced against nothing. He should be able to interpret the past, see the present, and think into the future. He can then organize his material in terms of the child's experience instead of the subject matter. He will be able to stimulate the mind rather than cram the memory. He should learn to economize time by making assignments clear, definite, attractive, and not too long. He should have a problem in each lesson and develop it. The questions asked should be thought provoking in leading the pupils to reason towards the conclusion. Any teacher who does not give his pupils an opportunity to think out their own problems, is preparing for them a rapid elimination from school. Results of poor teaching are like results of poor workmanship in that they are expensive. The well prepared teacher emphasizes crop rotation and tried varieties until new ones have proven to be of more value than those now raised. He will emphasize the value of improving live stock by better breeding, selection and care. He will emphasize the fact that an increase of live stock increases soil fertility and that it is not what one makes, but what one saves that counts.

When the teacher takes an inventory of himself and finds that he has rural mindedness, understands the learning process and the problems of adolescence, has ability to tell how and why, he will be prepared to be a teacher of young men

and women instead of a teacher of a particular subject. The results of his efficiency can largely be judged by the agricultural enterprises in the community and by the broad visions of his people.

CHAPTER XV

THE FUTURE OF AGRICULTURAL EDUCATION

The future of agricultural education will depend upon the type of teachers who enter the profession and upon the kind and amount of training that is given them. With close coöperation between the state supervisors of agricultural education and the teacher training institutions, more efficient plans will gradually be worked out. With a greater opportunity for community service and with increased salary, the teaching profession will be more attractive to the better class of teachers. Commercial firms are realizing more and more that increased efficiency in their business means employing higher priced specialists. What is true in the commercial world is true in teaching vocational agriculture.

By requiring practical farm experience before entering the profession, there is a tendency to select only those who can appreciate the high school pupil's point of view in conducting his project work.

The author's experience in training teachers for vocational agriculture at the University of California, at the University Farm School located at Davis, California, beginning during the recent war, is conclusive that the project method is the type of training best suited to their needs. The University of California is operating a farm at Davis of a thousand acres, which offers a good opportunity to try out project work in connection with training teachers.

Each division as, animal husbandry, poultry husbandry, pomology, olericulture, etc., is provided with land and equipment for practical work.

One of the requirements in training the future teachers of agriculture should be that unless they have had sufficient successful farm experience, that they conduct a plant or animal project in connection with their training. For example, the student-teacher has had practical experience in all the general fields of agriculture except in the swine industry. His project should then be in feeding for pork production or raising pigs to market age, which work would be correlated with the class instruction in swine husbandry. Since the student-teachers assume financial responsibility of their projects, arrangements should be made so that they can borrow money for this purpose at the legal rate of interest and carry on a project during the entire year in connection with the class work. Close supervision by a well qualified person who is in sympathy with this type of work should be given. The methods used and records kept give the student-teacher the best type of training for his future work. It has been found that eight or ten pigs make a splendid pork production project or about three sows secured before farrowing time. About ten breeding ewes secured in the fall make a good sheep project. From a hundred to a hundred-twenty-five laying hens make another very desirable project in connection with this training work.

A small area of bearing fruit leased for a year is satisfactory. Most all vegetables grown on a commercial scale, as cabbage, sweet corn, potatoes, etc., can be made satisfactory. One of the best projects thus far tried out by the author to test the managerial ability and manipulative skill was that of handling fourteen acres of alfalfa. This project consisted of testing the soil for amount of water

needed, irrigating, harvesting, marketing the crop, hiring extra help, and keeping records of all the business transactions.

In some sections growing vegetables would not be so satisfactory where the student-teacher leaves before the crop is harvested. It is desirable for the teacher trainer to have full charge of the projects unless the division concerned is entirely in sympathy with this type of work. The records kept by the student-teacher should be submitted to the teacher training class for discussion and criticism, if the project is taken at the same time that the Methods class is given. Each member of the training class should have the opportunity of visiting the projects at frequent intervals. The members of the class listen to the discussions of each other's projects and in this way are preparing themselves for future activities. A very valuable lesson is the study of market quotations, in order to get the best prices obtainable for the products. The author once had a student-teacher who reported a decline in the hog market of a half cent per pound. By keeping his hogs two weeks longer they were sold for three-fourths of a cent per pound more than otherwise would have been received. Another example was that of a student-teacher taking advantage of a threatened decline in the price of cabbage, receiving twenty dollars more per ton by selling early. When the student-teachers in the class get the benefit of such experiences as these, they will be better prepared to aid their high school pupils with marketing problems.

This type of training strengthens their weak points in preparation by coming in contact with many different lines of practical work. By having a written contract, stating the details of the project and having it signed by all parties concerned, it gives the student-teachers experience in legal

TEACHERS' HOME IN A RURAL COMMUNITY
Rollo, Illinois

EARLY TRAINING IN LIVE-STOCK PRODUCTION

FIRST PRIZE

LUTHER BURBANK, AT THE LEFT, SHOWING C. L. HAMPTON, THE LOCAL TEACHER OF AGRICULTURE, HIS PLANT GARDEN

transactions. They are doing a type of work similar to that which they will soon be called upon to supervise.

This type of work does not lessen the amount of class work and laboratory instruction, but utilizes more of the leisure time. The student-teacher is putting into practice the things learned in the class room so as to be better equipped to direct future activities.

The future of agricultural education is tending more and more toward the actual method of learning by doing when the student-teacher will have had sufficient practical farm experience. It must be remembered that in securing an education, one must go behind the rule of thumb in studying the underlying principles. It is for this reason that the teacher needs a strong background in the biological sciences. There is danger also that the underlying principles may be sacrificed for the practical side. The bread and butter aim is not all of an education. We must go into the underlying principles and see the reasons for the productive enterprises that are being carried on. The future training schools will establish new precedence in their methods of approach. Many of the outlines of the courses in agriculture submitted in the future will be made on the job analysis plan. That is, pulling out every job connected with each phase of the enterprise, as the work develops. Efforts will continue to be made to get the maximum efficiency with the least amount of waste in securing an education. As new training schools develop, land will be made available for the student-teachers to actually do project work. Conditions, as nearly as possible, will be made similar to the actual life on the farm. A more efficient method of keeping records will be worked out by some genius. More scientific methods of teaching will continue to be put into practice. More and more emphasis is being placed on the proper method of

instruction and on the best methods of supervising home project work. The teachers trained in the future will have a degree in agriculture plus practical farm experience. As the standard for certification in the various states is continually being raised, only the better prepared teachers will qualify for vocational agriculture.

It is imperative that a good system of placing teachers be maintained in order that candidates for teaching vocational agriculture will not enter other work. The student-teacher should utilize his time in getting information and in studying methods of presentation, feeling sure that if his work is up to a high standard, he will be properly located. The recent war has demonstrated the fact that many non-essentials can be eliminated in various kinds of work, without decreasing efficiency. This is also true in teaching agriculture. The war caused a shortage of teachers and then came the problem which needed immediate solution for better prepared teachers trained in a shorter space of time. The new system of giving projects in connection with the school work, as part of the regular instruction, is one which the teacher trainers of the future will more and more consider.

The teacher of the future will no longer be considered as a specialist in one particular subject only, but he will be prepared to offer suggestions in the various fields of agriculture. He is also going to be a factor in helping young men and women to find their occupation or profession, for every pupil who enrolls in the classes in agriculture will not become a farmer. Another consideration of the future is that the teacher may have a longer tenure of office.

With better trained teachers more satisfactory methods of instruction are sure to follow. More emphasis in the future will be given to the following:

1. A broader preparation for a background.
2. A better knowledge of the subjects to be taught.
3. Better methods of presentation.

The teacher in the future will be one who has an aptitude for teaching. He will be one who possesses leadership and a strong personality which will inspire young men and women to do their best. The agricultural interests in the community will soon show the results of efficient teaching. More of the young men and women will be trained for the work which they will follow later in life. The same inspiration that causes many more to go to college will cause them to return to be worth more to the community in which they live.

Emphasis will be placed upon making real men and women rather than trying to do college work in making specialists in any particular occupation or profession. With this type of trained teachers working in harmony with all the different educational forces for the betterment of all mankind, the future of vocational education is assured.

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